

Regulatory Framework for Broadband Investment and Competition (Comment)

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I. Introduction

A. Broadband (BB) services

general purpose technology (GPT) for the 21st century
large-scale investment and benefits

B. BB players

fixed/mobile telephone providers
wireless operators
cable operators
broadcast stations
other providers (electric power companies, railway/highway companies, etc.)

C. Access services

natural-monopoly
competition via cable, wireless

II. The Challenge

A. Using market competition for growth

1. free operation, free entry and exit
2. advantage of market separation → level-playing field
 - horizontal (by geographical service areas)
 - vertical (access/interexchange)
 - functional (by service layers: infrastructure/network/applications)

Note: the terms “vertical” and “functional” may not be used by others in the same meaning as used here.

B. Advantages of integration

in providing services
for R&D
→market integration

C. Universal BB access services

users in high-cost areas
handicapped users

D. Possible market failures

1. high investment risk
 - the demand for BB may be lower than expected
 - possible emergence of superior technology in the future
 - investment may be decreased by the risk
2. long period for investment returns (> 30 years)
 - critical-mass point may be far away in the future
 - investment finance may be difficult
3. monopoly abuses
 - by dominant operator
 - a. internal cross-subsidization by integrated BB operator
 - may exploit competing providers
 - interexchange operators in case of vertical integration
 - ISP's in case of functional integration
 - harmful to competition in BB access services
 - b. monopolistic pricing of BB access retail services by dominant operator
 - may exploit end users

E. Possible regulatory and public-policy failures

1. regulation of interconnection charges on vertically/functionally integrated operator
 - a. excessive regulation
 - may decrease investment by BB operator
 - b. insufficient regulation
 - may discourage the business of ISPs or interexchange operators
2. regulation of BB access retail prices on dominant provider
 - a. excessive regulation
 - may decrease investment by BB access provider
 - b. insufficient regulation
 - end users may be exploited
3. subsidy to BB operator for encouraging BB investment
 - a. excessive subsidy
 - may waste public fund
 - b. insufficient subsidy
 - BB investment may not reach desired level
4. subsidy on universal BB services
 - a. excessive subsidy
 - may be costly to general users

- b. insufficient subsidy
 - high cost/handicapped users may not be able to use BB
- 5. the challenge
 - impossible to determine an optimal degree of intervention/subsidies
 - need for discretionary decisions
 - need for repeated adjustments with trials and errors
 - may generate regulatory uncertainty and discourage BB operators
- 6. the depreciation-period problem (with NTT, Japan)
 - long physical/economic depreciation period (> 30 years)
 - short depreciation period for tax purposes (\approx 15 years)
 - a. in short run:
 - high average cost of BB services in accounting
 - high service price
 - low corporate tax, high profits
 - b. in long run:
 - high corporate tax, low profits

III. Investment in BB Access Infrastructure in Japan

A. BB access services by NTT via optical fibers

- 1. NTT's FTTH infrastructure
 - OLT: optical line terminal
 - SI: splitter inside NTT building
 - FP: feeder point
 - SO: splitter outside NTT building
 - ONU: optical network unit
 - Average distance:
 - OLT ~ ONU: 2,000 m
 - FP ~ ONU: 200 m
 - 2. definitions
 - BB = BB1 + BB2
 - BB1: FTTH
 - BB2: cable, DSL, wireless
 - BB1: OLT ~ ONU (2,000 m, aver.)
 - BB1a: OLT ~ SO
 - BB1b: SO ~ ONU (< 200 m, aver.)
- <Fig. III.A.1>

B. Statistics

- 1. BB serviceable areas (#subscribers)
 - (areas connected at least to SO)

- a. BB1: 91%
- b. all BB: 99%
- 2. BB penetration (#subscribers)
 - a. BB1: 34%
 - b. all BB: 62%
- 3. access-service prices
 - a. FTTH (Internet, IP-phone)
 - ¥5,000/month with very low call rates
 - b. DSL/PSTN (Internet, phone)
 - ¥4,000 ~ 4,500/month with high call rates
 - c. PSTN (phone only)
 - ¥1,500/month with high call rates

C. NTT operations

- 1. BB investment accumulated (~2010)
 - a. fixed BB access (optical)
 - ¥3 trill.
 - b. wireless (3G, 3.5G, LTE)
 - ¥5 trill.
- 2. fixed BB share of NTT (#subscribers)
 - a. BB1: 74%
 - b. all BB: 51%

- 3. net revenue (loss, -) with BB1 operation

year	¥ bill.	% of FTTH investment accumulated
2007	(-) 229.3	(-) 9.8%
2008	(-) 192.4	(-) 7.2%
2009	(-) 126.4	(-) 4.2%
.....		
2012	expected to break-even	

- 4. B/S of NTT (consolidated, March 2010)

a. fixed assets	10.2	54.3
BB1 fixed capital	3	16.0
BB mobile capital	5	26.6
other assets	8.6	45.7
Total	¥18.8 trill.	100%
b. fixed liabilities	6.0	31.9
pensions, etc.	1.3	6.9

long-term liabilities	4.7	25.0
other liabilities	3.7	19.7
net value	9.1	48.4
subscribers contributions accumulated *)	5.0 (est.)	26.6
<hr/>		
Total	¥18.8 trill.	100%

Note *) This is the total amount of once-and-for-all contributions paid by the subscribers since 1950; it is not listed in B/S of NTT after its privatization in 1985.

- c. long-term liabilities of NTT, March 1998: ¥2.4 trill.
March 2010: ¥4.7 trill.

D. Politics

- providers other than NTT:
 - complaining on NTT's dominance re BB1 interconnection charges/conditions
- proposal to separate the access-service department from NTT and to establish a public corporation for access services
 - for: Softbank, (ruling) Democratic Party (?)
 - against: NTT, KDDI, and other BB1 providers

decision postponed to 2011

IV. Three Possible Cases of BB Access Investment

A. Cases

- Case S:** slow investment, low positive returns
ex. AT&T (US) for telegraph and telephone: 1900 ~ 1950
- Case F1:** fast investment, losses initially but large positive returns in long run
ex. NTT (Japan) for telephone: 1955 ~ 1980
- Case F2:** fast investment, losses throughout (failure case)

B. BB penetration

<Fig. III.B.1>

C. Retail prices of BB access services

<Fig. III.C.1>

D. Average total cost of BB services

<Fig. III.D.1>

E. BB access capacities, working and idle

<Fig. III.E.1>

F. Net revenues from BB access investment

<Fig. III.F.1>

G. Net value of the BB access operator

<Fig. III.G.1>

V. Platform for Providing BB Access Services: A Proposal

A. Objective

To propose a framework to accelerate infrastructure investment in BB access services by using the power of competitive market as far as possible (i.e., by minimizing the extent of public intervention/subsidies).

B. Outline

1. functional separation of BB access market into 3 layers for accounting purposes:
 - (1) INF (construction and supply of infrastructure): free operation
 - (2) PL (platform for BB): monopoly, public operation
 - (3) AP (supply of application services): free operation
 - (0) (management of ROW, spectrum: public operation, not discussed here)<Fig. V.B.1,2>
2. regulation of the flow of BB access services:
 - a. INFs must sell all BB capacities to PL.
 - b. APs and end users must purchase all BB capacities from PL.
 - c. (i.e.,) direct deals on prices/service quantities between INFs and APs (end users) are strictly prohibited.
3. there is no regulation in the organization/operation of BB access providers except those as stated above (and others such as no discrimination of customers). In particular, a single provider may give both INF and AP services to users.
<Fig. V.B.3>

C. Business activities composing BB access services

1. R&D
2. planning/designing
3. BB1a: construction
 - (*) creation of service menu (capacity items, service period)
 - (*) determination of capacity size
4. supply of services
 - (*) pricing
5. BB1b: construction and supply of services
 - (*) creation of service menu
 - (*) pricing

6. retailing/customer relations (including AP services)

- marketing/sales
- billing/receiving
- customers complaints

Note: (*): activities are subject to intermediation/regulations by PL.

D. BB platform (PL):

1. PL is a public agent (e.g., public corporation).

to intermediate the demand and supply of BB access services.

to control the overall speed of BB investment.

to transfer the risk of BB investment from providers to end users.

by accepting short-term losses (i.e., by giving subsidies),

by pursuing long-run profits.

2. outline of PL operations

a. set a uniform price P of BB access services for APs (and end users) across all areas.

b. accept the demand Q 's for BB capacity from APs at the price P .

c. for each area, order and purchase the capacity Q 's from INFs; accept price P 's established competitively (via auction) by INF with a guarantee to purchase BB1a/BB1b capacities for a specified period.

d. calculate the net profit from the operations stated above. If it is positive, then lower the price P to encourage the demand by APs and end users.

e. if the net profit is negative, then make a decision whether to raise the price P to decrease the loss, or to subsidize the loss from a public fund.

f. subsidization of the loss is a short-run consequence of PL's taking the risk of BB investment. If the profit turns out positive in the long run, it means that the risk is overcome. If not, it means that the risk is not overcome causing a loss to PL, and ultimately to end users.

E. Supply of BB application services (AP)

AP is a free private activity/agent.

telephone providers, ISPs, etc.

may purchase BB capacities from PL.

may receive delivery and maintenance of BB capacity services directly from INF.

may sell BB applications services to end users.

F. Supply of BB infrastructure capacities (INF)

INF is a free private activity/agent.

FTTH providers, cable providers, wireless operators, etc.

may construct and own BB infrastructure capacity and sell its service to PL via auction prior to construction.

will receive payment for BB1a capacities regardless of actual subscription. BB1b capacities will be paid for partly on the number of actual subscription. may deliver BB capacity services directly to AP.

G. Implications

1. competition:
 - introduced to all operations of APs and INFs.
 - (→ facility competition)
 - intervention by PL is limited to the formation of a price P to AP's (and end users); this is (1) for achieving universal service, and (2) to control the overall speed of investment in BB access capacities.
2. advantage of integration:
 - allowed except for the purpose of intermediating and accounting the demand and supply of BB access services.
3. universal service:
 - realized by the adoption of a uniform price P across all service areas.
4. investment risk:
 - not eliminated, but transferred from BB providers to end users via PL.
5. monopolistic pricing of BB access services to end users:
 - excluded because PL does not maximize profits.
6. regulation of interconnection charges:
 - not needed because the operation of PL excludes internal cross-subsidization.
7. subsidy on BB investment:
 - may be done by PL to a desired extent; possibility of excessive/insufficient subsidization not eliminated.
8. the depreciation period problem (in Japan):
 - not entirely solved here; a reform of tax law may be needed.
 - solved to the extent that PL may purchase BB capacity from INFs for a time period corresponding to the physical/economic depreciation period.

H. Details

1. BB access capacity:
 - to be defined and measured by the quantity of *bit-streams* between a local-access point of the interexchange operator (OLT) and a receiving point of the end user (ONU) subject to a predetermined service specifications (such as maximum error rates, down time limit); physical medium for delivering bit-streams does not matter, it may be optical fiber, copper/coaxial cables, or radio spectrum.
2. specifications of one unit of BB access capacity to be put for auction by PL:
 - service area
 - guaranteed transmission rate (MB/s), up/down

conditions for service quality

max number of end users serviceable for each SO point in the area

length of time for service (e.g., 30 years)

guaranteed number of subscribers

3. specifications of one unit of BB access capacity to be offered by PL to APs and end users:

service point

guaranteed transmission rate (MB/s), up/down

conditions for service quality

initial subscription charge

monthly subscription charge

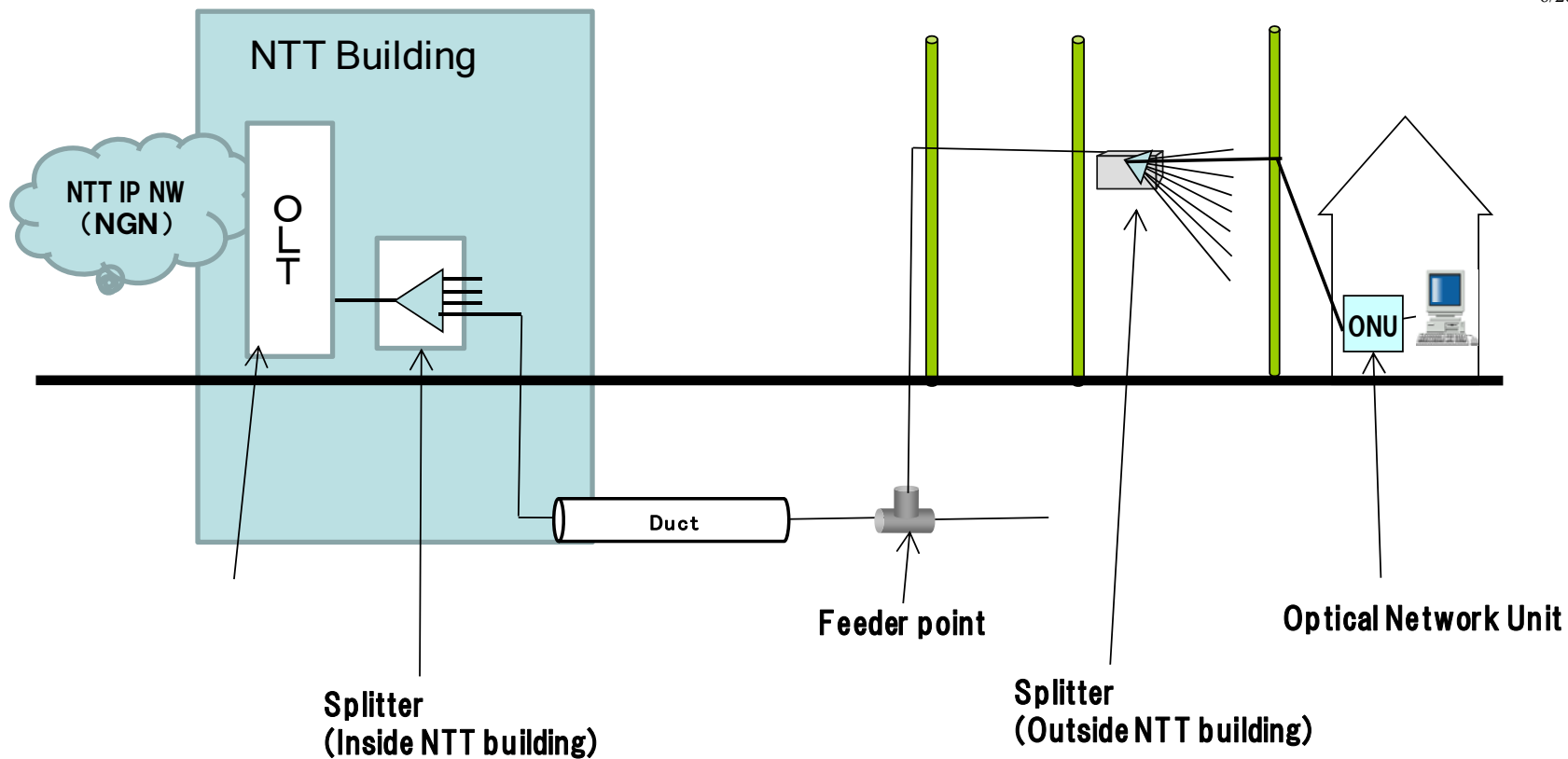


Fig. III.A.1 NTT's Optical BB Access System (Provided by NTT)

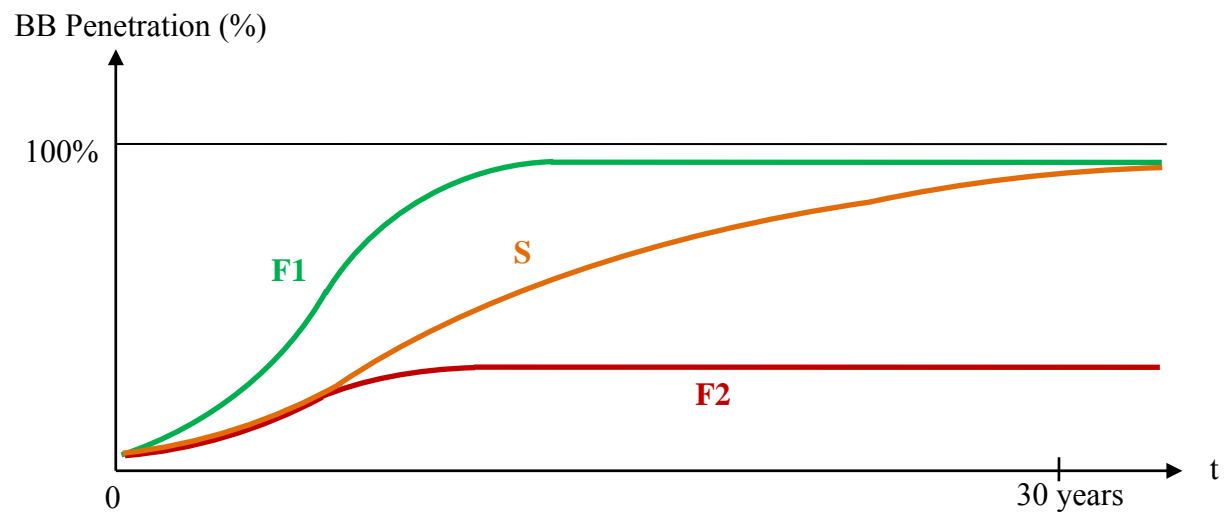


Fig. III.B.1 BB Penetration

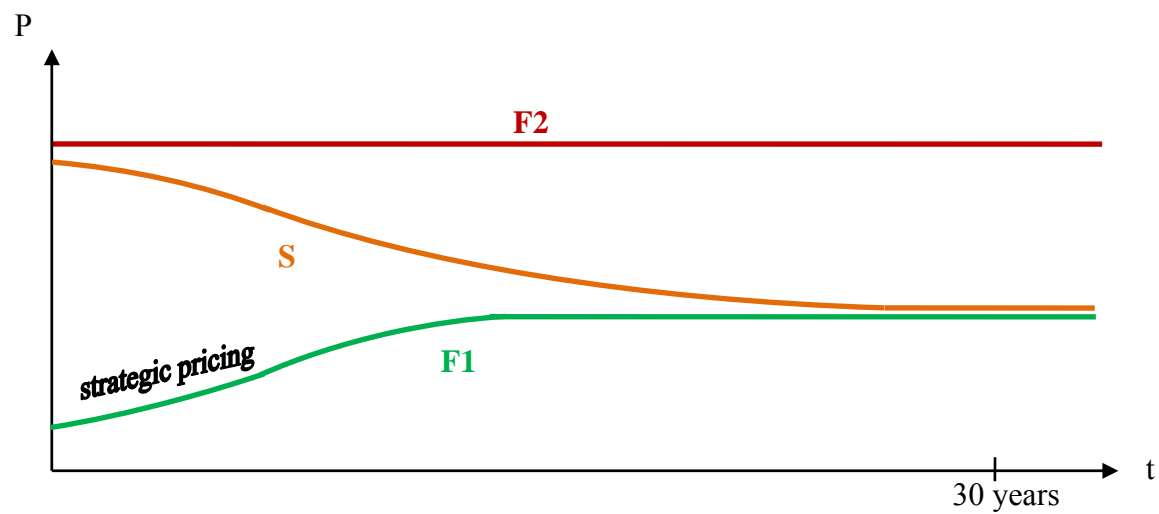


Fig. III.C.1 Retail Prices of BB Access Services

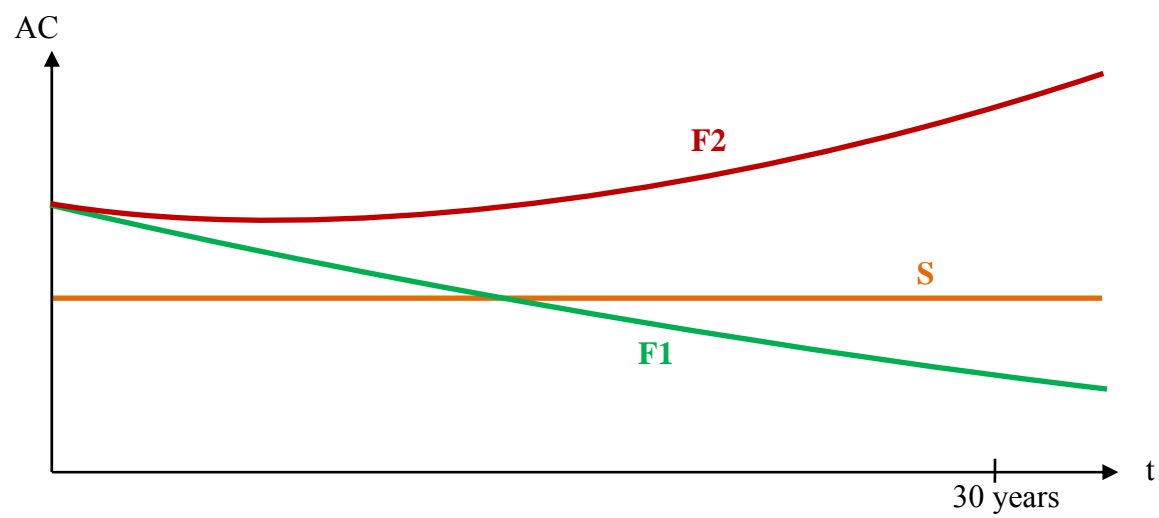


Fig. III.D.1 Average Total Cost of BB Services

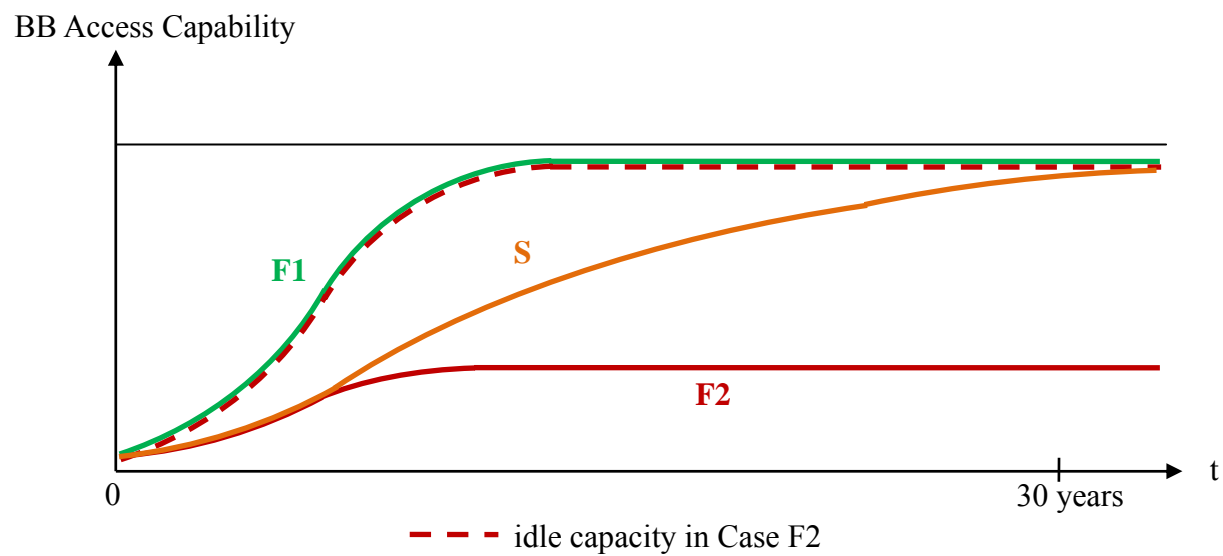


Fig. III.E.1 BB Access Capacities, Working and Idle

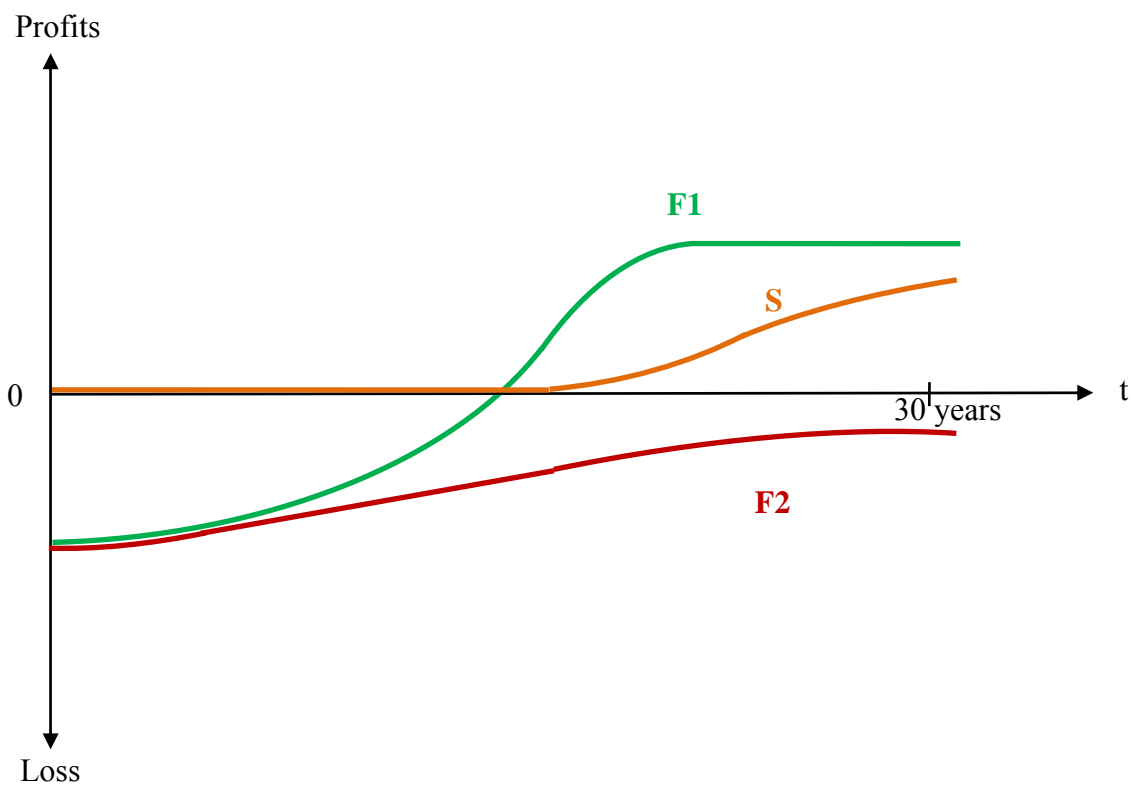


Fig. III.F.1 Net Revenues from BB Access Investment

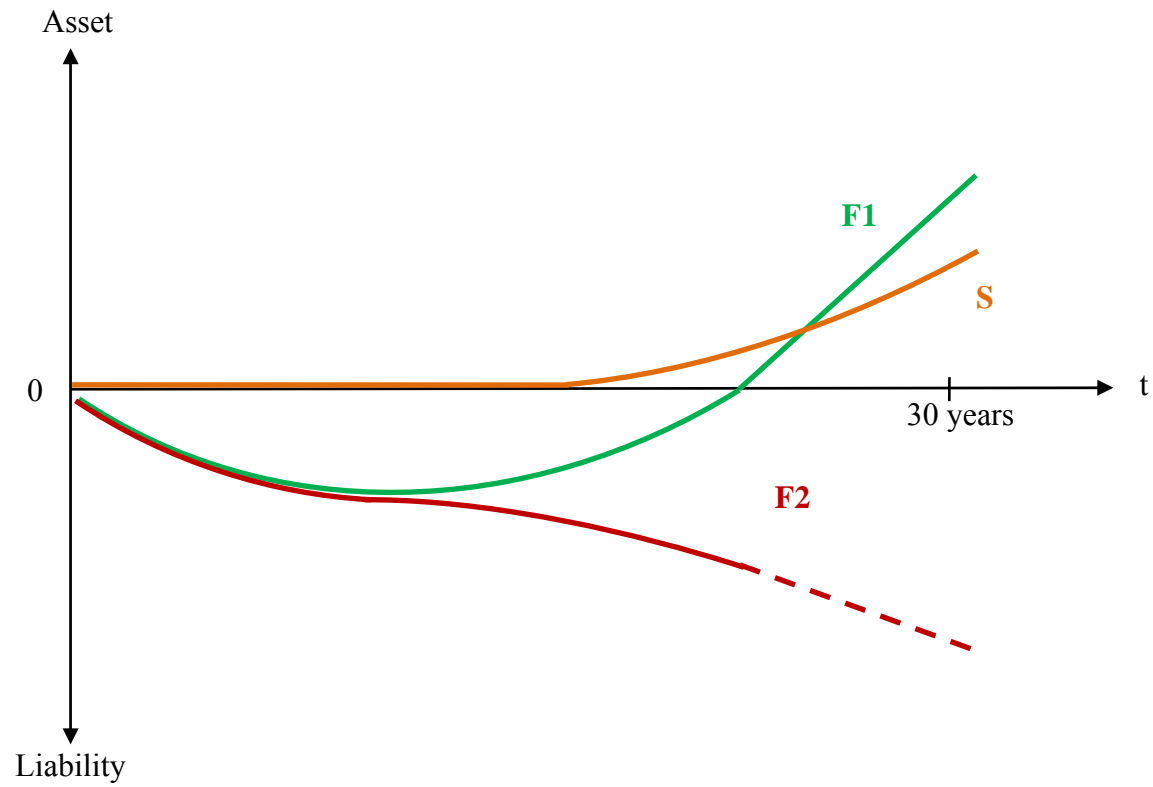


Fig. III.G.1 Net Value of the BB Access Operator

Function Level		Functions
3	Application Service (APs)	Purchase BB capacity, create and sell BB application services (private operation), end users
2	BB Platform (PL , Public Agent)	Intermediation of BB capacity for access services (monopoly, public operation)
1	Infrastructure (INFs)	Construct and sell BB capacity; optical fiber, cable, spectrum (private operation)
0	(Management of ROW, Spectrum use)	(Public operation)

Fig. V.B.1 Organization of Functions for BB Access Provision (Proposed)

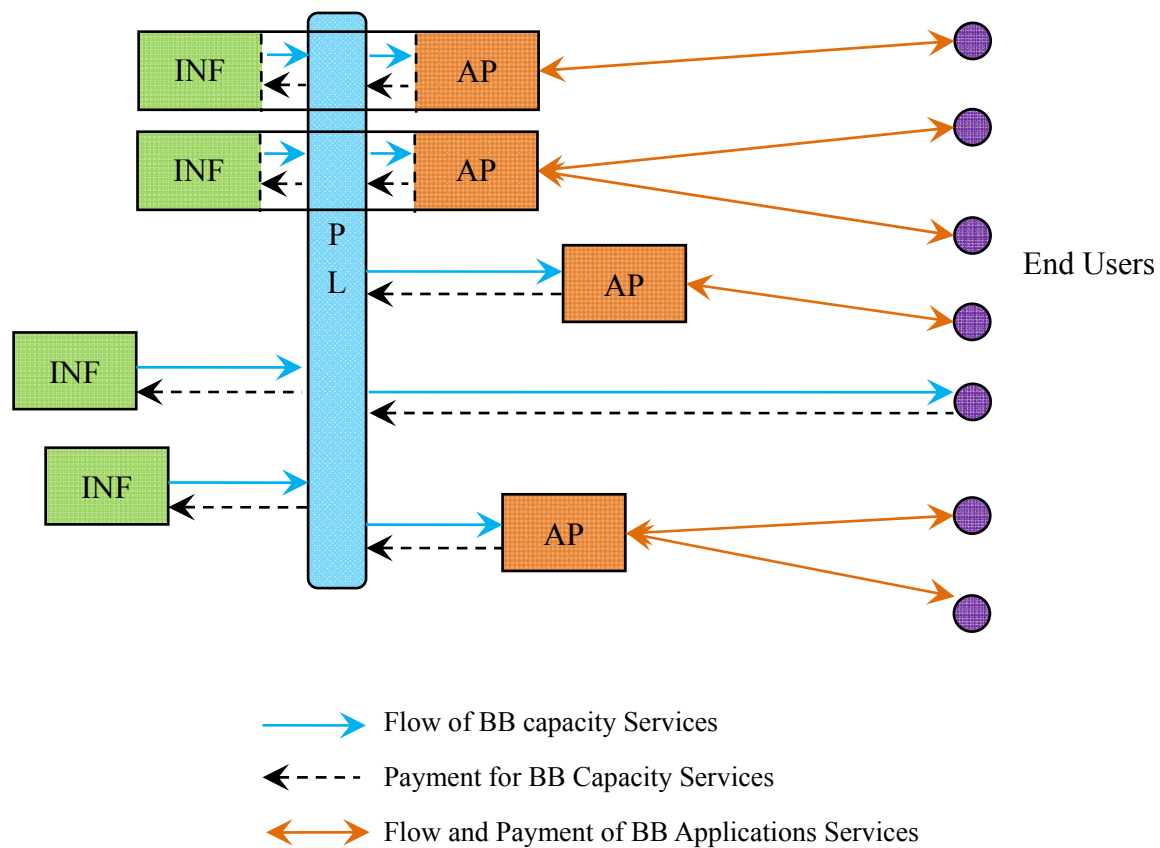


Fig. V.B.2 Illustration of Service Flows and Payments for BB Access Services

Level		Service Areas			Behavior Principles
		X	Y	Z	
3	APs	Accept P as given by PL. Choose and purchase Q's as desired.			Free operation; may maximize profits.
		Q _X	Q _Y	Q _Z	
2	PL	P (uniform price)			Adjust P so as to maintain zero net revenue (in the long run): $PQ - (P_X Q_X + P_Y Q_Y + P_Z Q_Z)$; profit maximization is prohibited strictly.
		Set/Adjust P toward no profit/loss. Accept Q's as chosen by APs.			
		Set Q's as accepted and invite offers from INFs. Accept P _X , P _Y , P _Z as offered competitively by INFs.			
		Q _X	Q _Y	Q _Z	
1	INFs	P _X	P _Y	P _Z	Free operation; may maximize profits.
		Offer P _X for given Q _X .	Offer P _Y for given Q _Y .	Offer P _Z for given Q _Z .	

Fig. V.B.3 Determination of Prices (P's)/Quantities (Q's) of BB Access Services with Areas X, Y, Z