

Regulatory Framework for Broadband Investment and Competition (Comment)

International Telecommunications Society
The 18th Biennial and Silver Anniversary Conference (ITS Tokyo 2010)
June 28, 2010

Hajime ONIKI
Director, Institute of Economic Information Research, Inc. (Japan)
oniki@alum.mit.edu
http://www.ab.auone-net.jp/~ieir/

EcInfCom

Contents

I. Introduction

II. The Challenge

III. Investment in BB Access Infrastructure in Japan

IV. Three Possible Cases of BB Access Investment

V. Platform for Providing BB Access Services: A Proposal

Regulatory Framework for Broadband Investment and Competition (Comment)

I. INTRODUCTION

I.A. Broadband (BB) services

general purpose technology (GPT) for the 21st century

large-scale investment and benefits

I.B. BB players

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

I.C. Access services

natural-monopoly

competition via cable, wireless

Regulatory Framework for Broadband Investment and Competition (Comment)

II. THE CHALLENGE

II.A. Using market competition for growth

1. free operation, free entry and exit

2. advantage of market separation
   → level-playing field

II.A. Using market competition for growth
2. advantage of market separation

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.

II.B. Advantages of integration

in providing services

for R&D

→ market integration

II.C. Universal BB access services

users in high-cost areas

handicapped users

II.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

II.D. Possible market failures

2. long period for investment returns (> 30 years)

- critical-mass point may be far away in the future
- investment finance may be difficult

II.D. Possible market failures

3. monopoly abuses

by dominant operator

II.D. Possible market failures
3. monopoly abuses

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

II.D. Possible market failures
3. monopoly abuses

b. monopolistic pricing of BB access retail services by dominant operator

- may exploit end users

II. The Challenge

E. Possible regulatory and public-policy failures

II.E.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

II.E.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

II.E.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

II.E.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

II.E.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

II.E.6. the depreciation-period problem (with NTT, Japan)

- long physical/economic depreciation period (> 30 years)

- short depreciation period for tax purposes (≒15 years)

II.E.6. the depreciation-period problem (with NTT, Japan)

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

Regulatory Framework for Broadband Investment and Competition (Comment)

III. INVESTMENT IN BB ACCESS INFRASTRUCTURE IN JAPAN

III.A. BB access services by NTT via optical fibers

1. NTT's FTTH infrastructure

OLT: optical line terminal

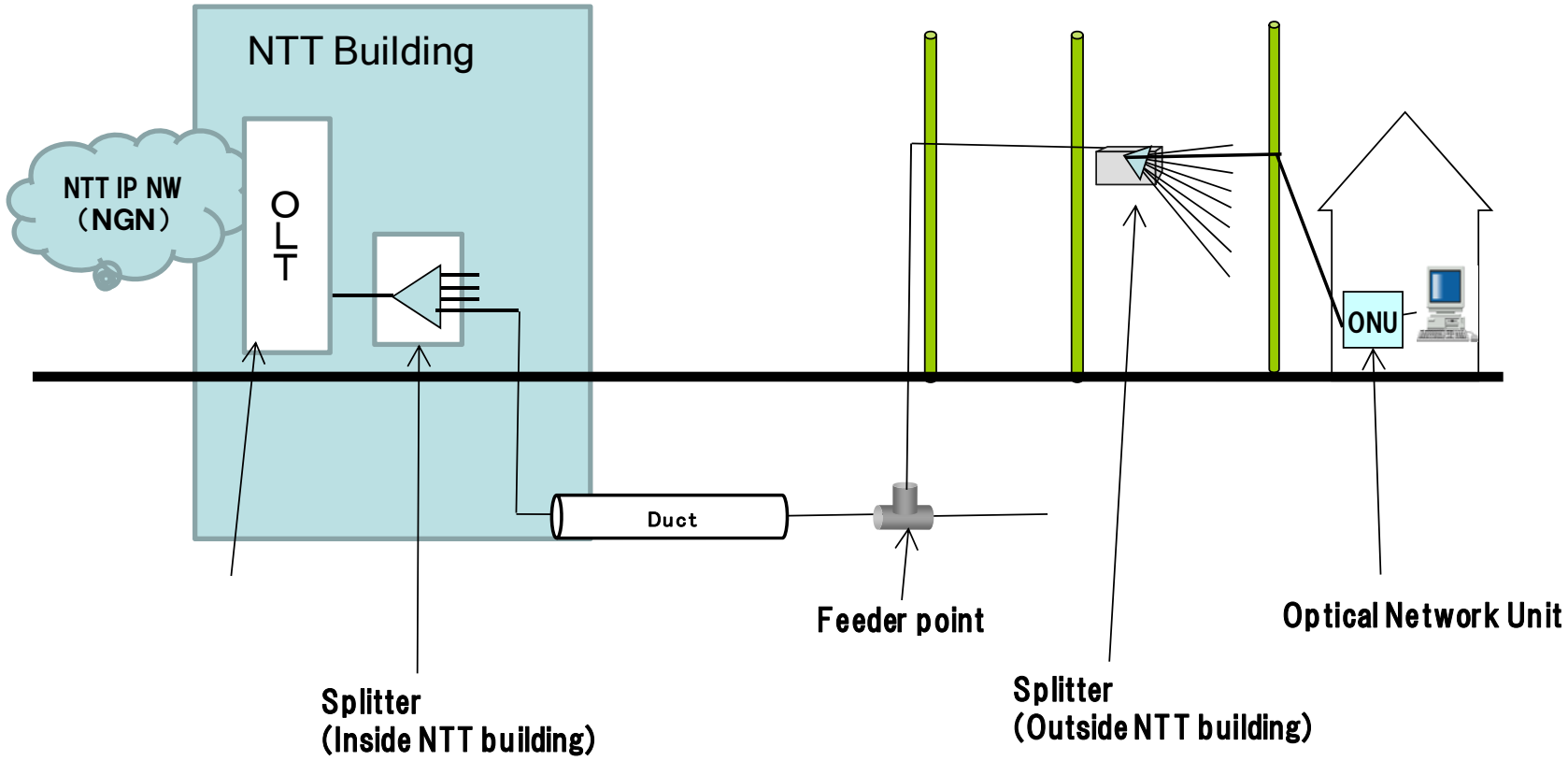
SI: splitter inside NTT building

FP: feeder point

SO: splitter outside NTT building

ONU: optical network unit

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



III.A. BB access services by NTT via optical fibers

1. NTT's FTTH infrastructure

Average distance:

OLT ~ ONU: 2,000 m

FP ~ ONU: 200 m

III.A. BB access services by NTT via optical fibers

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.)

III.B. Statistics
1. BB serviceable areas (#subscribers)

(areas connected at least to SO)

a. BB1a: 91%

b. all BB: 99%

III.B. Statistics
2. BB penetration (#subscribers)

a. BB1: 34%

b. all BB: 62%

III.B. Statistics

3. access-service prices

(areas connected at least to FP)

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

III.C. NTT operations
1. BB investment accumulated (~2010)

a. fixed BB access (optical)

¥3 trill.

b. wireless (3G, 3.5G, LTE)

¥5 trill.

III.C. NTT operations
2. fixed BB share of NTT (#subscribers)

a. BB1: 74%

b. all BB: 51%

III.C. NTT operations
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	

III.C. NTT operations
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%	

III.C. NTT operations

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

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
Total	¥18.8 trill.		100%	

III.C. NTT operations
4. B/S of NTT (consolidated, March 2010)

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.

III.C. NTT operations
4. B/S of NTT (consolidated, March 2010)

c. long-term liabilities of NTT,

March 1998: ¥2.4 trill.

March 2010: ¥4.7 trill.

III.D. Politics

1. providers other than NTT:

complaining on NTT's dominance

re BB1 interconnection

charges/conditions

III.D. Politics

2. 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

Regulatory Framework for Broadband Investment and Competition (Comment)

IV. THREE POSSIBLE CASES OF BB ACCESS INVESTMENT

IV.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)

Fig.III.B.1: BB penetration

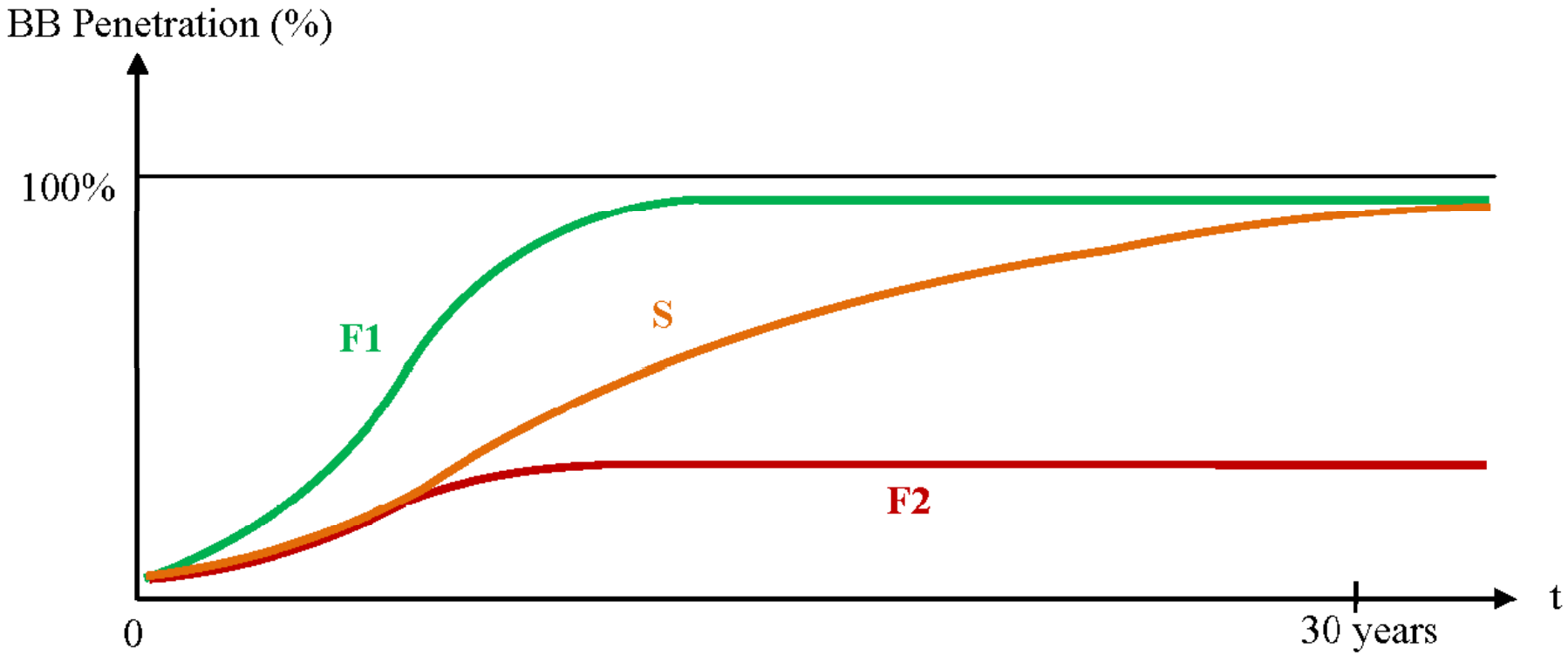


Fig.III.C.1: Retail Prices of BB Access Services

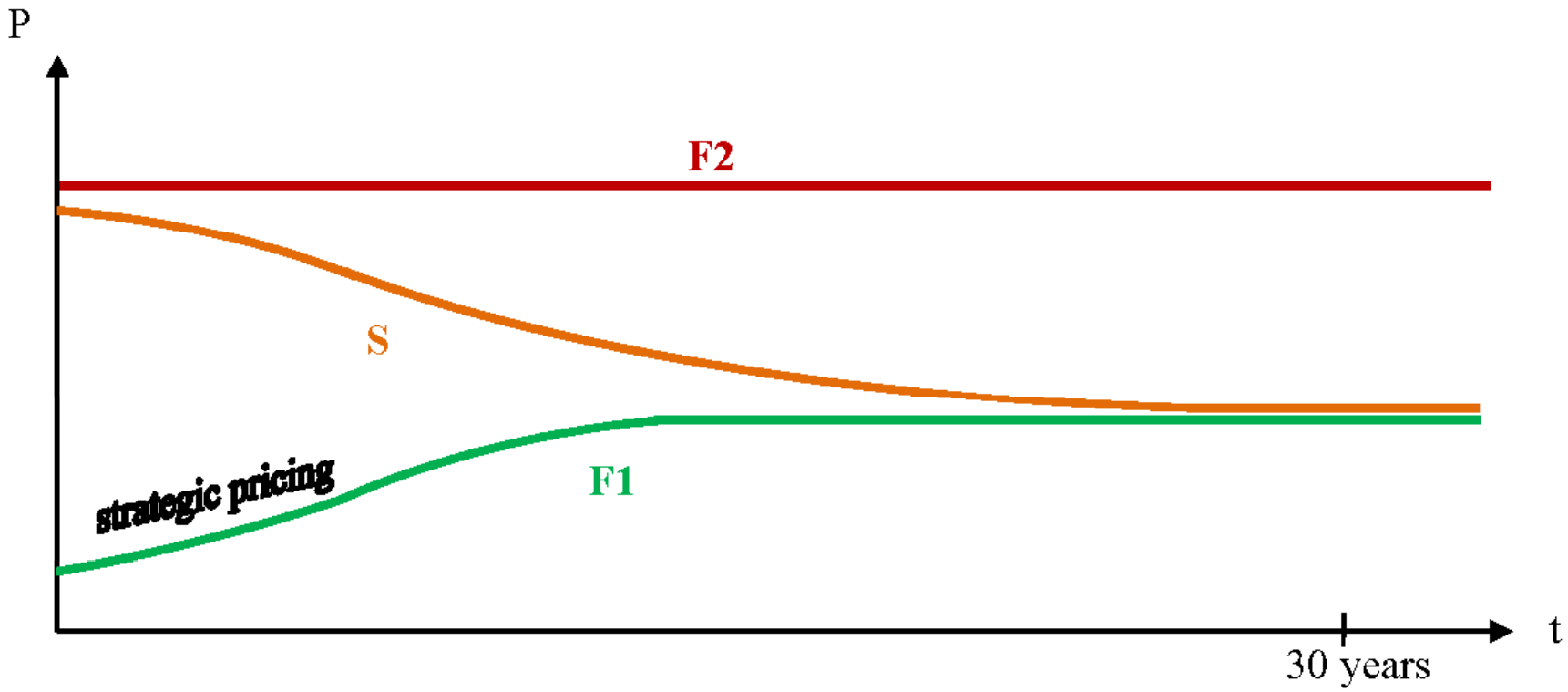


Fig.III.D.1: Average Total Cost of BB Services

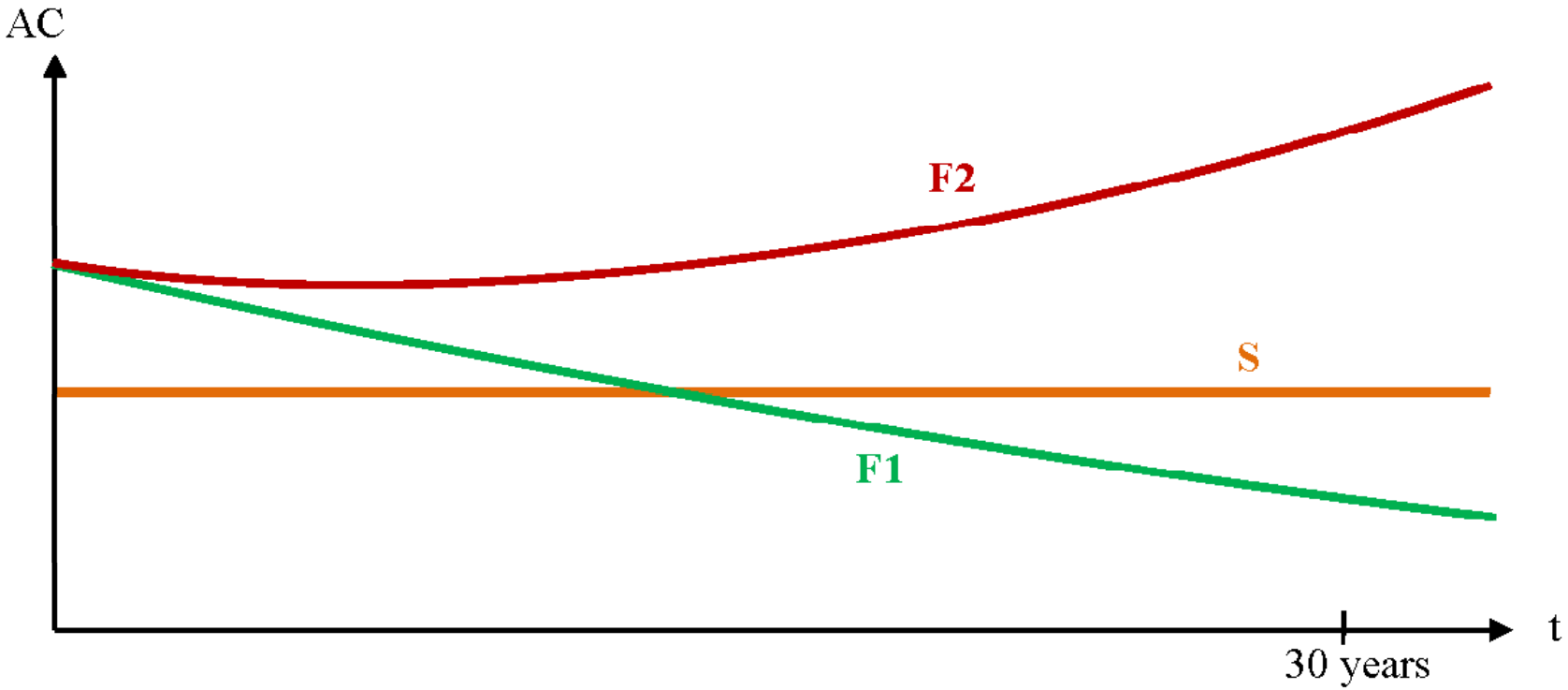


Fig.III.E.1: BB Access Capacities, Working and Idle

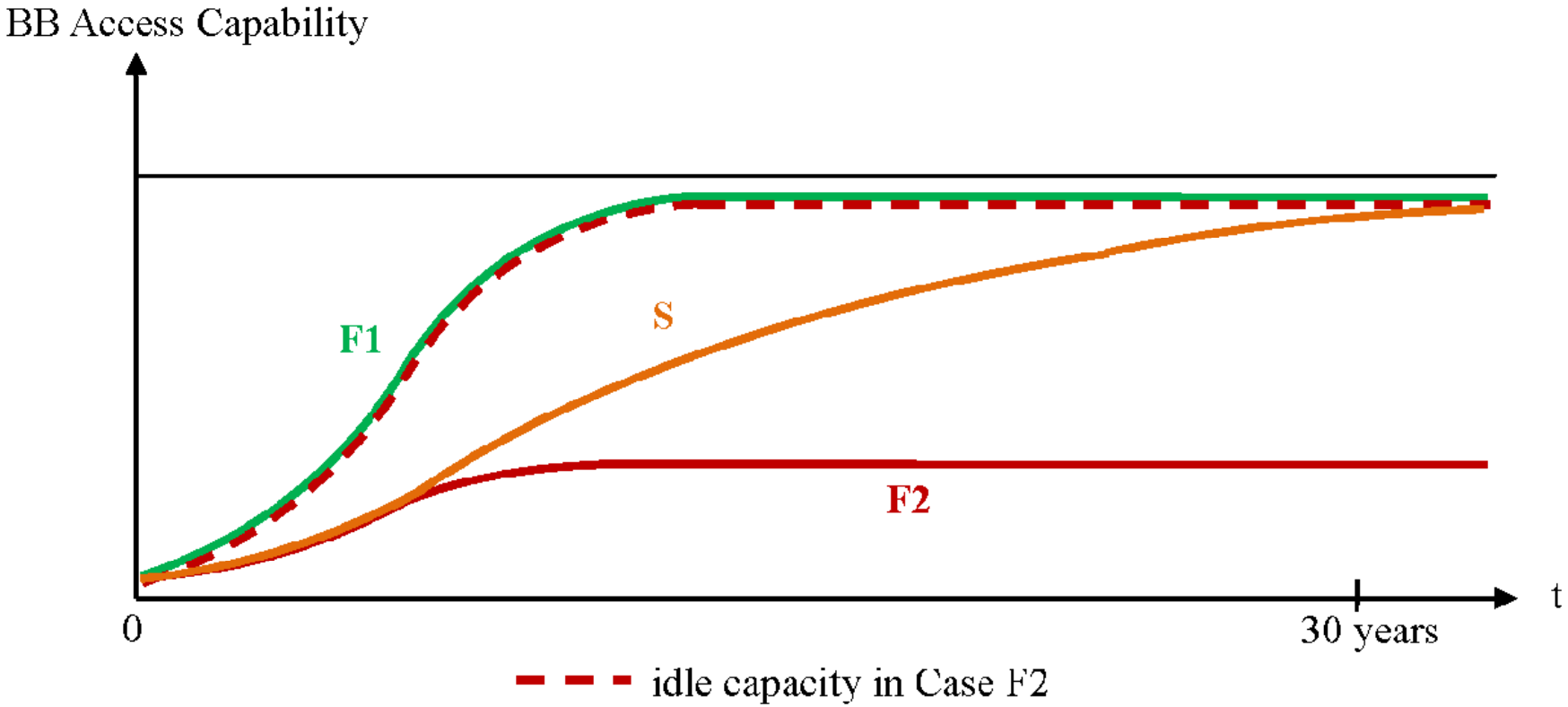


Fig.III.F.1: Net Revenues from BB Access Investment

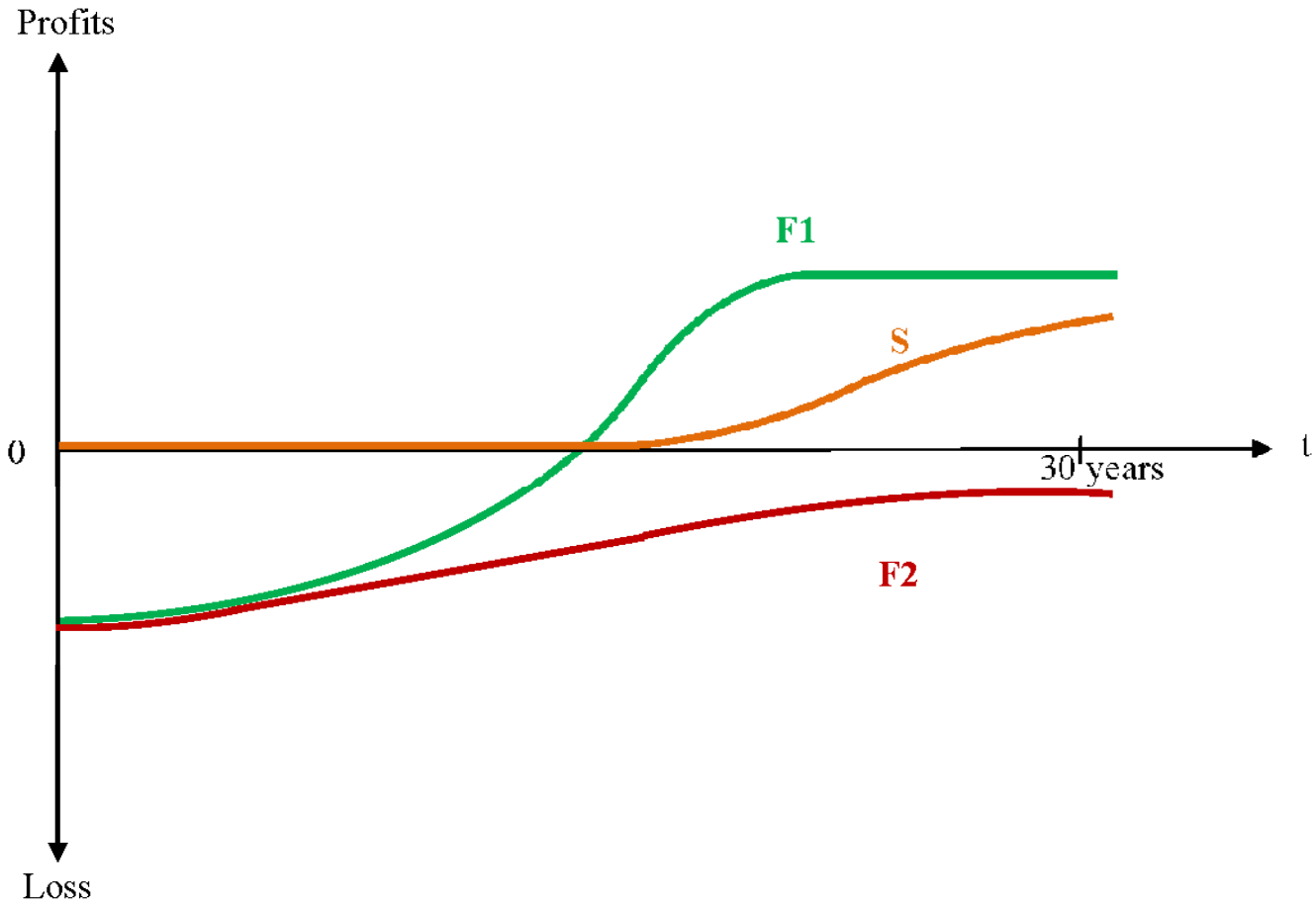
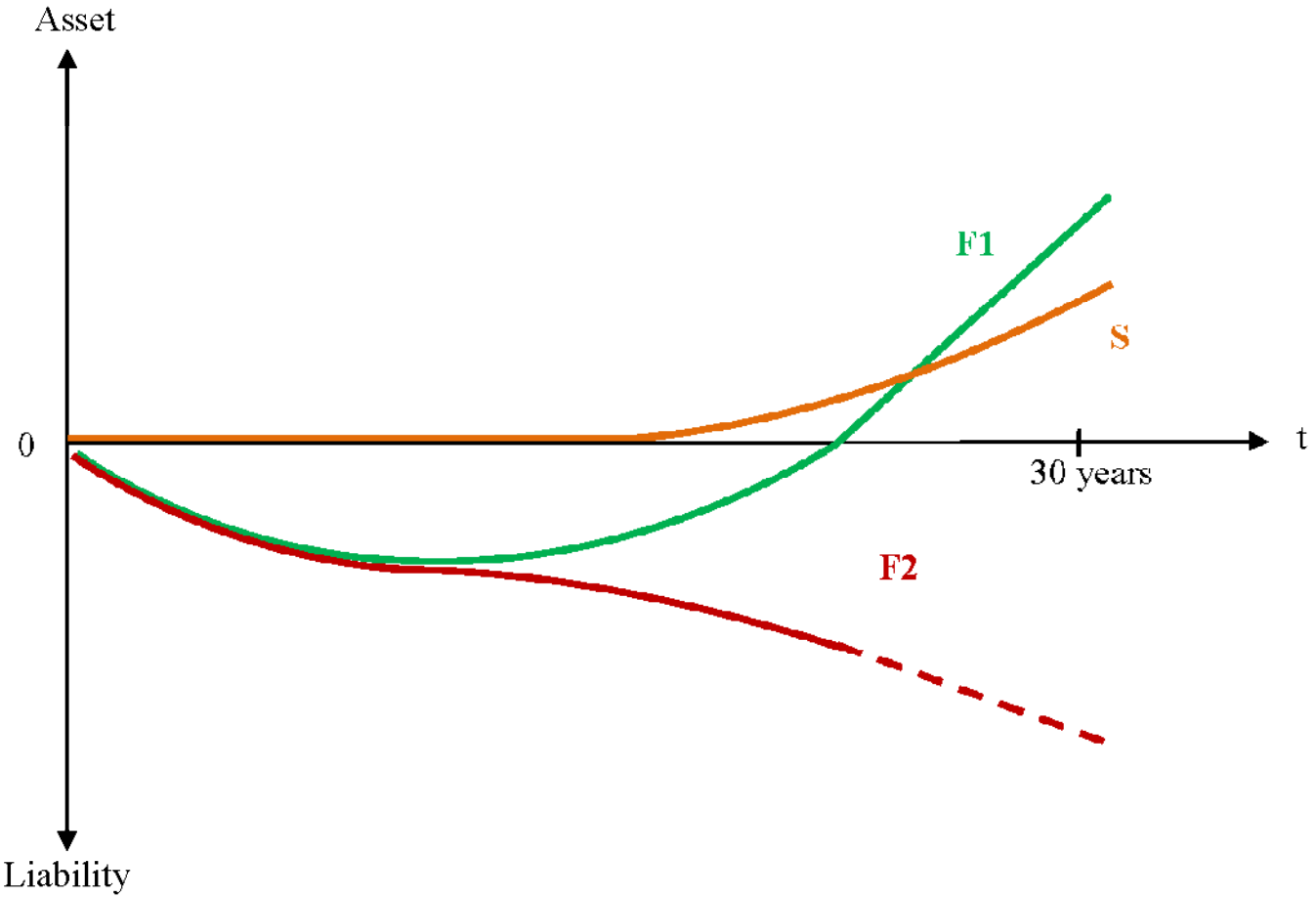


Fig.III.G.1: Net Values of the BB Access Operator



Regulatory Framework for Broadband Investment and Competition (Comment)

V. PLATFORM FOR PROVIDING BB ACCESS SERVICES: A PROPOSAL

V.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).

V.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

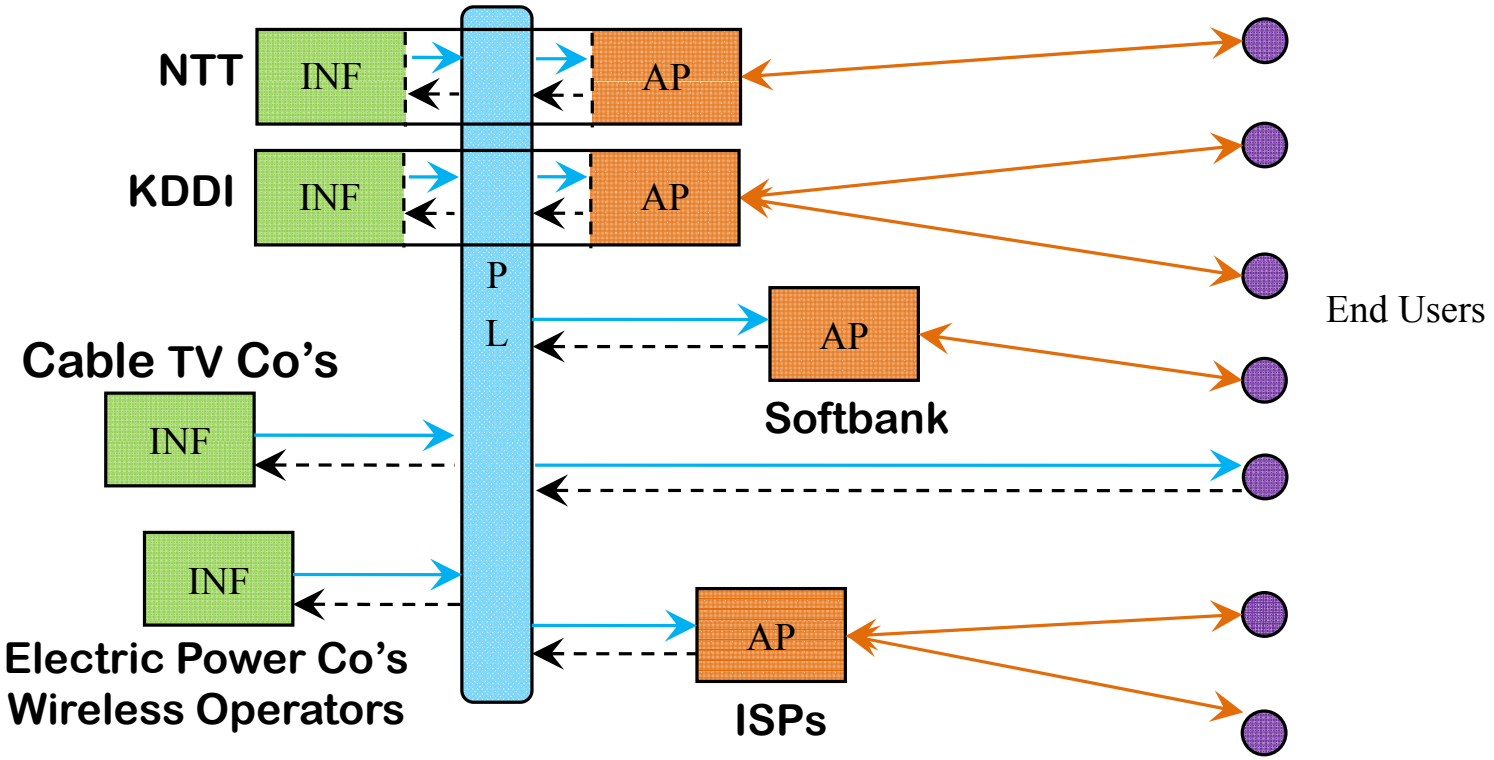
(3) AP (supply of application services): free operation

(0) (management of ROW, spectrum: public operation, not discussed here)

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

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.2: Illustration of Service Flows and Payments for BB Access Services (Japan)



H. Oniki

IV.B. Outline

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.

IV.B. Outline

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: Determination of Prices (P's)/Quantities (Q's) of BB Access Services with Areas X, Y, Z

<table>
<tr><th colspan="2" rowspan="2">Level</th><th colspan="3">Service Areas</th><th rowspan="2">Behavior Principles</th></tr>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td rowspan="2">3</td><td rowspan="2">APs</td><td colspan="3">Accept P as given by PL.
Choose and purchase Q's as desired.</td><td rowspan="2">Free operation; may maximize profits.</td></tr>
<tr><td>Q_X</td><td>Q_Y</td><td>Q_Z</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">PL</td><td colspan="3">P (uniform price)</td><td rowspan="4">Adjust P so as to maintain zero net revenue (in the long run): $PQ - (P_XQ_X + P_YQ_Y + P_ZQ_Z)$; profit maximization is prohibited strictly.</td></tr>
<tr><td colspan="3">Set/Adjust P toward no profit/loss.
Accept Q's as chosen by APs.</td></tr>
<tr><td colspan="3">Set Q's as accepted and invite offers from INFs.
Accept P_X, P_Y, P_Z as offered competitively by INFs.</td></tr>
<tr><td>Q_X</td><td>Q_Y</td><td>Q_Z</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">INFs</td><td>P_X</td><td>P_Y</td><td>P_Z</td><td rowspan="2">Free operation; may maximize profits.</td></tr>
<tr><td>Offer P_X for given Q_X.</td><td>Offer P_Y for given Q_Y.</td><td>Offer P_Z for given Q_Z.</td></tr>
</table>

IV.C. Business activities composing BB access services (1/2)

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

IV.C. Business activities composing BB access services (2/2)

5. BB1b: construction and supply of services

(*) creation of service menu

(*) pricing

6. retailing/customer relations (including

marketing/sales **AP services)**

billing/receiving

customers complaints

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

IV.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.

IV.D. BB platform (PL):
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.

IV.D. BB platform (PL):
2. outline of PL operations

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.

IV.D. BB platform (PL):
2. outline of PL operations

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.

IV.D. BB platform (PL):
2. outline of PL operations

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.

III.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.

IV.F. Supply of BB infrastructure capacities (INF) (1/2)

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.

IV.F. Supply of BB infrastructure capacities (INF) (1/2)

- 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.

IV.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.

IV.G. Implications

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.

IV.G. Implications

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.

IV.G. Implications

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.

IV.G. Implications

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.

IV.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.

IV.H. Details

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.

IV.H. Details

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.