STB Virtualization in IPTV World

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VP, New Media Technology
SK Planet and SK Broadband
**SK Group at a Glance**

**3rd largest conglomerate in Korea with over $130B revenue**

<table>
<thead>
<tr>
<th>Information and Telecommunications</th>
<th>Chemicals and Energy</th>
<th>Marketing and Logistics Services</th>
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</thead>
<tbody>
<tr>
<td>SK hynix</td>
<td>SK Innovation</td>
<td>SK networks</td>
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<td>SK C&amp;C</td>
<td>SK energy</td>
<td>SK walkerhill</td>
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<td>SK telesys</td>
<td>SK chemicals</td>
<td>SK M&amp;C</td>
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<td>SK telink</td>
<td>SK E&amp;S</td>
<td>SK securities</td>
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<td>SK gas</td>
<td>SK shipping</td>
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<td>SK E&amp;C</td>
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</table>
SK telecom
Korea’s leading telecommunications company

Number 1
Mobile network operator in Korea

26 million
Subscribers Over 50% market share

$13 billion
Annual revenue in 2011

Pioneer
World’s first to build CDMA network and satellite DMB Service, etc.
SK Broadband
Korea’s second largest broadband and IPTV company

<table>
<thead>
<tr>
<th>High-speed Internet (4.3 million)</th>
<th>IPTV (B tv) (1.4 million)</th>
<th>Voice</th>
<th>Corporate business</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-speed internet</td>
<td>Local call</td>
<td>Domestical/Int’l Leased Line</td>
<td></td>
</tr>
<tr>
<td>- Fiber Lan(100M)</td>
<td>local call</td>
<td>Internet Leased(IPT)</td>
<td></td>
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<tr>
<td>- FTTH</td>
<td>long distance call</td>
<td>Ethernet Leased Line</td>
<td></td>
</tr>
<tr>
<td>- cable modem(HFC)</td>
<td>Int’l call(005,00766)</td>
<td>MPLS/IP VPN</td>
<td></td>
</tr>
<tr>
<td>- Value added services</td>
<td>VoIP(internet call)</td>
<td>Corporate phone</td>
<td></td>
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<tr>
<td>TPS</td>
<td>universal access number</td>
<td>IP Telephony</td>
<td></td>
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<tr>
<td></td>
<td>collect call /lifelong number</td>
<td>IDC and CDN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Managed Service (Bcube)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Market Share

### Subscribers & Market Share

<table>
<thead>
<tr>
<th>Company</th>
<th>Mobile</th>
<th>Broadband</th>
<th>IPTV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SK</strong> (SKB, SKT)</td>
<td>26,806 (1&lt;sup&gt;st&lt;/sup&gt;)</td>
<td>4,348 (2&lt;sup&gt;nd&lt;/sup&gt;)</td>
<td>1,259 (2&lt;sup&gt;nd&lt;/sup&gt;)</td>
</tr>
<tr>
<td>KT</td>
<td>16,480</td>
<td>8,014</td>
<td>3,587</td>
</tr>
<tr>
<td>LGU+</td>
<td>10,020</td>
<td>2,736</td>
<td>990</td>
</tr>
</tbody>
</table>
SK Planet

SK planet
Spearheading global innovation in media and technology

Mission

• To be the leading global provider of new media services and platforms for content, commerce community and communications

New entity

• SK planet was spun off from SKT in October 2011
• Goals of the spinoff: to sharpen focus on developing and operating new media services and platforms in an agnostic, fast-moving, and smarter-device-dependent market environment

Key metrics

• 2012e financials (including subsidiaries): -> $1.5B in revenue and profitable operations
• 1,090 employees (SK Planet only)
• HQ: Seoul, Korea
Key subsidiaries and services from commerce & content to media

- **Melon**: Korea’s #1 digital music download and subscription service
- **hoppin**: Korea’s 1st n-Screen personal VOD streaming service
- **TICTOC**: SNS with over 15M users
- **store**: Korea’s #1 mobile app store
- **1ST**: Open e-commerce marketplace with 31% market share
- **map**: Korea’s most widely used navigation service
- **SK communications**: Portal, PC messenger, SNS
STB & Application Virtualization
(Case Study: SK Broadband IPTV Service)
Big Movement in TV Industry

Pay TV Operators want to deliver more advance TV UX and leverage TV-centric App ecosystem.
## Gap Analysis

The only answer to Pay TV Operators is to replace legacy STB and upgrade to SMART STB

<table>
<thead>
<tr>
<th></th>
<th>Smart Mobile</th>
<th>Smart STB</th>
<th>Legacy STB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales Price</strong></td>
<td>Very High</td>
<td>High / Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>($600 ~ $900)</td>
<td>($120 ~ $140)</td>
<td>($70~ $100)</td>
</tr>
<tr>
<td><strong>Life Span</strong></td>
<td>Very Short</td>
<td>Moderate (to Short)</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>(1.2 ~ 1.5 yrs)</td>
<td>(2yr ~ 5yr)</td>
<td>(5+ yrs)</td>
</tr>
<tr>
<td><strong>Sales Scale</strong></td>
<td>Very Large</td>
<td>Small</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>(10M ~ 100M / model)</td>
<td>(2M ~ 10M / model)</td>
<td>(2M ~ 10M / model)</td>
</tr>
<tr>
<td><strong>OS / Middleware</strong></td>
<td>Android, iOS, (Tizen/Web)</td>
<td>Web, Android, (iOS)</td>
<td>Linux, Web, OCAP, ACAP, Flash, SKAF</td>
</tr>
<tr>
<td><strong>AP Performance</strong></td>
<td>Very High</td>
<td>Moderate (to High)</td>
<td>Very Low</td>
</tr>
<tr>
<td></td>
<td>(6,000 ~ 12,000 DMIPS)</td>
<td>(3,000 ~ 6,000 DMIPS)</td>
<td>(300 ~ 1,500 DMIPS)</td>
</tr>
<tr>
<td><strong>Ecosystem Scale</strong></td>
<td>Very Large</td>
<td>Small</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Concerns on Smart STB

Pay-TV Operators are reluctant to invest on Smart STB due to many financial, political, technical issues. ROI on Smart STB investment can not be guaranteed yet.

(1) SMART STB COST : HIGH

✓ [Example] Unit price of high-end profile STB = $120
  (based on Google TV 2.0 H/W requirements)
  $120 x 1 million users = $120 million
  $120 x 10 million users= $1.2 billion

✓ NOTE: Risk due to the higher H/W spec. requirements

(2) SMART STB LIFE SPAN : SHORT

✓ Frequent OS upgrade release
✓ Very fast H/W performance upgrade cycle
✓ Average life span of smart mobile devices = 1.2 ~ 1.5 yr
(3) FRAGMENTATION : VERY HIGH

✓ H/W fragmentation
  from old legacy STB to high-end profile smart STB

✓ S/W fragmentation

✓ Common denominator vs. Complex maintenance (due to fragmentation)

(4) TV APP ECOSYSTEM : STB DEPENDENT

✓ No strong leader in the industry yet

✓ However, STB dependency increases risk of investment on a specific TV app ecosystem

✓ Samsung Smart TV 3.0 platform

✓ LG Smart TV (HP Web OS)

✓ Android & Google TV 2.0/4.0

✓ OIPF, Adobe Flash, OCAP/ACAP, etc.
Concerns on Smart STB

(5) TIME TO DEPLOY : LONG

✓ Average legacy STB upgrade cycle = 5+ years
✓ Rapidly growing scale of smart STB from competitors
✓ Minimum scale of smart STB as an initiative to drive TV App Ecosystem

(6) SMART STB Maintenance Cost : HIGH

✓ Higher complexity, higher maintenance burden
✓ [Example] Technician stop for residential service = min. $50 / stop

(7) SMART STB Performance : Moderate

✓ [Example] Google TV 2.0 H/W supports casual games, but can not support console games
✓ Another cost to scale up Smart STB performance; Replacement of legacy smart STB
STB & Application Virtualization - Introduction

The upcoming STB & Application Virtualization technology replaces the intelligence from the STB to the network, providing new services and advanced TV UX very efficiently and quickly on any STB or connected devices.
STB & Application Virtualization - Benefits

STB & Application Virtualization technology comes up with a lot of attractive advantages resolving many smart STB issues

<table>
<thead>
<tr>
<th></th>
<th>Smart STB</th>
<th>STB Virtualization</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>STB Unit Cost</td>
<td>High</td>
<td>Low</td>
<td>Ultra-low cost STB</td>
</tr>
<tr>
<td>STB Lifespan</td>
<td>Short</td>
<td>Very Long</td>
<td>Server-side upgrade</td>
</tr>
<tr>
<td>Fragmentation</td>
<td>Very High</td>
<td>Fragmentation-free</td>
<td></td>
</tr>
<tr>
<td>Time to Deploy</td>
<td>Long</td>
<td>Instant Deployment</td>
<td>Re-util. of legacy STB</td>
</tr>
<tr>
<td>STB Maintenance</td>
<td>Moderate</td>
<td>Low</td>
<td>Thin client</td>
</tr>
<tr>
<td>STB Performance</td>
<td>Moderate (to High)</td>
<td>Very High</td>
<td>Console game</td>
</tr>
</tbody>
</table>
| TV App Ecosystem     | STB Dependent | STB Agnostic | Samsung Smart TV 3.0
|                      |           |                    | LG HP Web OS                  |
|                      |           |                    | Android / GTV 2.0/4.0         |
|                      |           |                    | Adobe Flash, etc.             |
STB & Application Virtualization – Open Beta Service

1. **Schedule:** 4Q, 2012

2. **# of Subscribers:** 2,000 users

3. **Legacy STB:** Celrun 910H, 900HR (Released in 2006)

4. **Advanced Services**
   - (1) IPTV/VOD/EPG GUI
   - (2) TV Application / Games

5. **Service Area:** Seoul and Busan (Distance from Seoul: 350 miles)
STB & Application Virtualization – Target STBs

Celrun TD 910H

- Computing Power: 300 DMIPS
- RAM Memory: 128M
- GPU: Not supported
- OS: Linux 2.6.15
- BOM: N/A
- RCU: IR with 4D key

Ultra-low Cost STB

- Computing Power: 1,100 DMIPS
- RAM Memory: 128M ~ 256M
- GPU: Not supported
- OS: Linux 2.6.15
- BOM: $20 or less
- RCU: RF with Touch Pad
Demo

STB_Virtualization_Demo_SKPlanet.mp4
1. Willingness to use the service even after closing promotion: 91%


3. Willingness to use high-end profile games ever after applying a charge: 17%

4. Benefits users satisfied
   (1) Faster booting speed and channel zapping speed
   (2) Advanced UI
   (3) Widget (with clock, calendar, etc.)

5. Concerns to be fixed
   (1) Quality (Video): 29%
   (2) UI: 28%
   (3) Game: 16%
Further Considerations

1. Latency
   - 120mSec, 150mSec, or longer?

2. Concurrent User Capacity
   - CCU per blade
   - CCU per $1.00

3. Network Bandwidth
   - High-profile games: 3~4 Mbps or higher
   - GUI: 1Mbps or lesser

4. Others
   - OS License Cost (Windows vs. Linux)
Q & A

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