

Patent licensing in IoT: An economics perspective

Prof. Dr. Joachim Henkel

TUM School of Management
Technical University of Munich

Conference

The Way towards the Internet of Things:

Open Standards vs Silos

Florence 15 November 2019



Agenda

- 1** The amount of FRAND royalties
- 2** Component or product level licensing
- 3** Effect on innovation and small firms
- 4** Conclusion

FRAND royalties

EC Guidelines for Applicability of Article 101, § 289:

Fees should “*bear a reasonable relationship to the economic value of the IPR [...]*”

“it may be possible to compare the licensing fees charged by the company in question for the relevant patents in a competitive environment before the industry has been locked into the standard (ex ante) with those charged after the industry has been locked in (ex post).”

How FRAND in IoT is not determined

Not proportional to device price:

- Value contribution of IoT capability to expensive device may be very small.
- Reference to device price invites excessive royalty demands.

Not related to stage in value chain:

- Economic value of a technology embodied in a device is realized by the end user.
- Amount of FRAND royalties should be independent of where they are charged.

Not the incremental value:

- With > 2 parts and complementarities (i.e., nearly always), incremental value misleading.
- Illustration: Incremental value of the battery to a smartphone is close to 100%.

- ➔ To determine a technology's value contribution to a device, need to consider overall device value, all components, and their interaction in creating use value.
- ➔ For complex IoT devices, this is difficult to impossible to do consistently.

Not the incremental value

Argument: “A licensee’s maximum willingness-to-pay for a technology (including its patents) is that technology’s incremental value to the product.”

Correct only in simple cases.

Incorrect if more than two technologies are complementary to each other:

- E.g., incremental value of the battery to a smartphone is ~ 100% since w/o battery a smartphone is hardly usable.
 - However, a buyer’s maximum willingness-to-pay for the battery is much lower than the price of the smartphone.
- ➔ To determine a technology’s value contribution one needs to consider overall device value, all components, and their interaction in creating use value.

Not the incremental value: A model

Three symmetric components A, B, C, sold by three different firms

They create the following value: One component: 0; two components: x ;
three components: $x + y$ (assumption: $y > 2x$, otherwise three-firm coalition not stable)

Assumption: Actors share surplus equally (but argument holds also with any other sharing rule)

Sequential grouping, showing C's "incremental value" (A and B joined, then C joins {A,B}):

- First step: A and B each receive $x/2$
 - Second step: {A,B} and C each receive $y/2$
- } A, B each receive $x/2 + y/4$
} C receives $y/2$.

Simultaneous grouping (fair distribution): Each actor receives $(x+y) / 3$

- ➔ Sequential grouping creates artificial distortion in favor of C if $y/2 > (x+y)/3 \Leftrightarrow y > 2x$.
- ➔ In all sensible cases ($y > 2x$, stable), the "incremental value" exceeds C's fair value share.
- ➔ With strict complementarity ($x = 0$), C would even receive $1/2$, thus twice as much as A, B.
- ➔ Problem is aggravated with a larger number of players: If C joins a group of N other actors and if complementarity is strict, then with "incremental value" C would obtain $1/2$, all others $1/(2N)$.

Royalty stacking, hold-up

For IoT as for other communication technologies, royalty stacking and hold-up are issues.

Royalty stacking due to often large number of licensors:

- Patent pools
 - Individual practicing patent owners
 - Privateers
 - Other Patent Assertion Entities
- ➔ Exert negative pricing externalities on each other.
- ➔ Excessive royalty demands, slowed-down adoption (Cournot 1838).

Hold-up: Royalty demands often only after standard adopted & adopters have switching cost.

- ➔ In determination of FRAND royalties, consider (hypoth.) ex-ante situation with competition.
- ➔ Positive example: MPEG LA; declared royalties right after standard establishment.

Price discrimination: Component or device level?

Value contribution of an IoT function varies between products. → In principle, case for price discrimination.

Possible on device level, component level, or intermediate stages.

Device level:

- In principle, can be more accurate (considers device and component).
- However, high complexity due to diversity of devices.
- Correctly accounting for value contribution in each case difficult to impossible.

Component level:

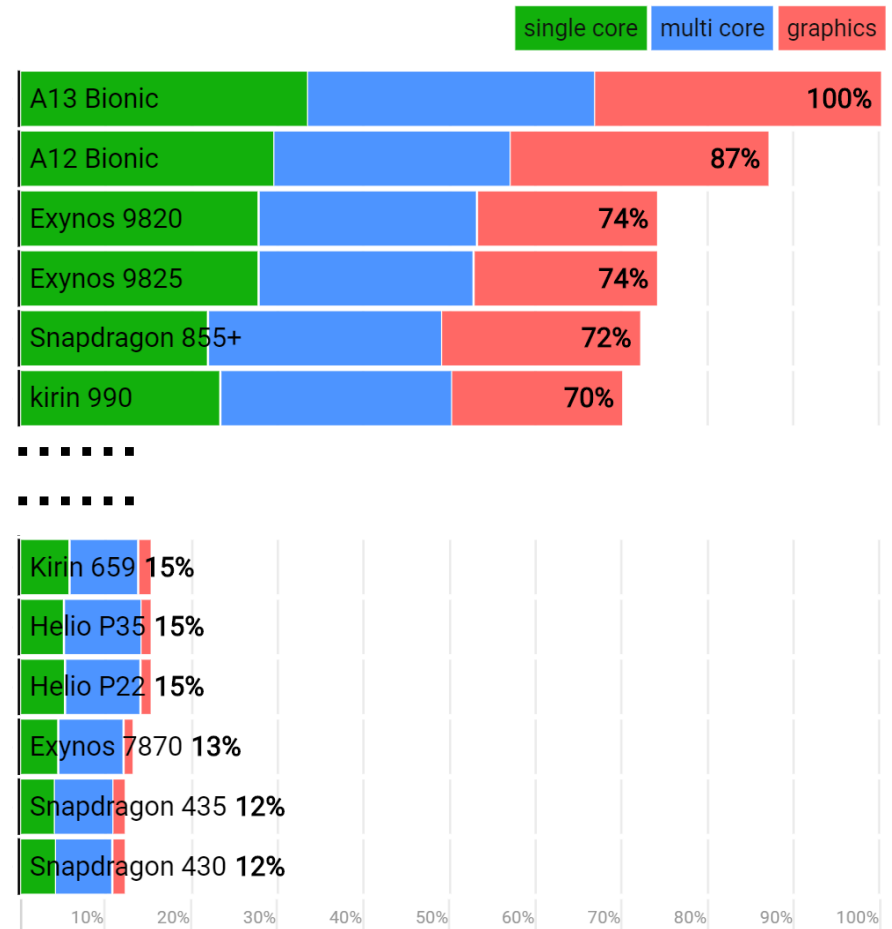
- Does not explicitly consider final use of component.
- However, final use correlated with component quality.
- Better quality of component linked to higher value from patented technology.
- Simpler due to small number of component vendors.
- Was common industry practice in the past

Price discrimination on component level

Techrankup.com (2 Nov 2019):
48 different smart phone processors
with differing performance

Differing prices good basis for
price discrimination of SEP licenses.

Capture standard-related
differences between devices rather
than those stemming from screen,
camera, marketing differences.



FRAND sets limits to price discrimination

Price discrimination requires monopoly power.

FRAND definition (§ 289) refers to pricing in ex-ante competition.

- Actual competition only in some cases (e.g., Blu-ray vs. HD DVD)
- LTE, 5G: Development of alternative solutions not feasible → single solution, “cartel”
- Need to consider also hypothetical ex-ante competition

→ FRAND requirement sets limits to price discrimination.

Agenda

- 1 The amount of FRAND royalties
- 2 Component or product level licensing
- 3 Effect on innovation and small firms
- 4 Conclusion

Licenses on all stages of value chain

Actors on all stages of the value chain have the right to a FRAND license (cf. Kühnen, 2019).

Royalties should be charged at one stage only.

- Reduces transaction cost
- Otherwise nontransparent, risk of double-dipping

Other stages should receive a free license. Options:

- Individual licenses (but: high transaction cost)
- General covenant not to sue/enforce (but: definition, legal certainty?)
- Component-level licensing: Simple; downstream licenses come with component

Transaction-cost perspective

For ICT, typically:

- Few component manufacturers; competent in technology.
- Large number of device makers; typically unable to evaluate royalty demands.

For consistent licensing at device level:

- Huge transaction cost: Identification, negotiation, contracting, monitoring.
- E.g.: With 1000 device makers, 20 patent holders: 20,000 licensing contracts.
- Difficult for small firms → entry barriers.

- ➔ Impossible to do device-level licensing consistently (“ND”) for all makers of IoT devices.
- ➔ On component level, small number of licensors; consistent licensing of all actors possible.

TC, illustration: Large number of Wi-Fi devices

Search for “Wifi” on Amazon.de yields “over 70,000 results” in 30 departments

1-48 of over 70,000 results for "wi-f

Department

Computers & Accessories

Computer Routers

Computer Networking Wireless
Access Points

Whole Home & Mesh Wi-Fi
Systems

Computer Networking

Computer Tablets

USB Computer Network Adapters

Repeaters

Apps & Games

Wi-Fi Analyzers

Electronics

Tools & Home Improvement

Cell Phones & Accessories

Industrial & Scientific

Home & Kitchen

Automotive Parts & Accessories

Office Products

Health, Household & Baby Care

Digital Music

Toys & Games

Appliances

Garden & Outdoor

Musical Instruments

Sports & Outdoors

Baby

Books

Clothing, Shoes & Jewelry

Pet Supplies

Prime Video

Kindle Store

Everything Else

Arts, Crafts & Sewing

Beauty & Personal Care

Movies & TV

CDs & Vinyl

Handmade

Grocery & Gourmet Food

Kindle Accessories

TC, illustration: Few Wi-Fi chipset manufacturers

1. Broadcom
2. Qualcomm Atheros
3. MediaTek
4. Marvell
5. Intel
6. Realtek
7. STMicroelectronics
8. NXP
9. Texas Instruments

Agenda

- 1 The amount of FRAND royalties
- 2 Component or product level licensing
- 3 Effect on innovation and small firms
- 4 Conclusion

Effect on innovation, small firms

Problems with IoT patent licensing:

- Unforeseeable number of licensors
- Royalty demands often only after adoption of technology (hold-up)
- Amount of demands difficult to estimate ex ante, esp. with innovative applications

Aggravated by device-level licensing:

- Device makers lack technical understanding of the standard and its SEPs
- Startups and small firms also lack:
 - Patent knowledge
 - Legal competence
 - Time to deal with legal issues
- Innovator does not know the cost ex ante since the product is not yet developed

To support innovation, esp. from small firms:

- Simplify licensing – component level, patent pools
- Ensure prices are publicly announced early on

Agenda

- 1** The amount of FRAND royalties
- 2** Component or product level licensing
- 3** Effect on innovation and small firms
- 4** Conclusion

Conclusions

Amount of FRAND royalties

- Related with value contribution to device
- Associated with quality of component
- Price discrimination limited by “FR” requirement

Component- vs. device-level licensing

- Consistent device-level licensing difficult to impossible
- Component-level:
 - Lower transaction cost
 - All relevant firms consistently licensed; hold-out much more difficult
 - Speeds up adoption if downstream firms know they obtain components with all required licenses
 - Simplifies market entry for small / new firms

Scope for policy interventions, favoring:

- Component-level licensing
- Patent-pools
- Early and public announcement of licensing conditions

Grazie