

Lecture 11

Technology Standards and Standard Essential Patents

E5104 – Economics of Innovation

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How Many Technical Standards are in a Laptop Computer?



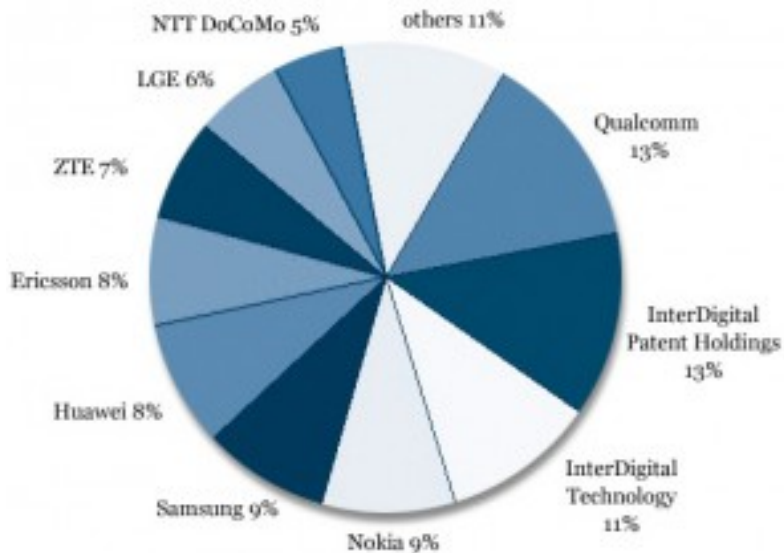
Biddle et al. (2010)

- How many standards are embodied in a modern laptop computer?
- How many of these standards are developed by formal standards development organizations and how many by consortia?
- What type of intellectual property rights policies – e.g. *RAND* or *royalty-free* – apply to each of these standards?
- At least 251 interoperability standards embodied or directly utilized (focus on display, graphics, sound, storage, BIOS, input device, processor, power, file system, networking, wireless, I/O ports, memory, software, codecs, content protection, security)
- 112 (44%) developed by consortia, 90 (36%) by formal standards development organizations, and 49 (20%) by individual companies
- Allocate 197 of the 251 standards into one of three broad categories: 148 (75%) *RAND*, 43 (22%) *royalty-free*, and 6 (3%) utilized a patent pool

LTE (Long Term Evolution): 4th Generation (4G) Mobile Network Communication Technology

- High-performance radio platform technology
- Technology package composed of thousands of “technology parts”
- Developed by 3rd Generation Partnership Project (3GPP) which consists of 6 SSOs (ARIB, ATIS, CCSA, ETSI, TTA, TTC)
- Critical decisions:
 - When considering the evolution of the 3G system, towards LTE, the 3GPP community decided to use IP (Internet Protocol) as the key protocol to transport all services.
 - It was therefore agreed that the Evolved Packet Core (EPC) would not have a circuit-switched domain but that the EPC should be an evolution of the packet-switched architecture used in GPRS/UMTS.

Who Owns LTE SEPs?



A Few Definitions and Concepts

- **Technology standard:** centralized solution through coordination when different technology components have to work together
- **Standard Setting Organizations (SSO):** coordinate 'selection' of a technology to establish standard and determine corresponding 'standard essential patents'
- **Standard Essential Patents (SEP):** patent protecting invention that is essential for a technology (often to produce downstream product) – patent has no substitute
- **(F)RAND licensing:** license of SEPs on fair, reasonable and non-discriminatory terms, usually promised by owners of SEPs
- We focus on standards in ICT – but standards apply much more broadly

Standards and SSOs

- Types of standards
 - **Sponsored** – proprietary standard introduced by single firm or joint-venture (examples: VHS or Betamax, Blu-ray-HDVD)
 - **Un-sponsored** – determined by the market (arise naturally due to popularity)
 - Set by the government / regulatory authority (mandated by government or voluntary agreement)
- Role of standards:
 - Compatibility
 - Safety or minimum quality
 - Reduction of variety
- Non-rivalrous, self-enforcing due to strong network effects but potential delays in adoption

SSOs

- Examples: European Telecommunications Standards Institute (ETSI), Institute of Electrical and Electronics Engineers (IEEE), Telecommunications Industry Association (TIA), Internet Engineering Task Force (IETF)
- Role of SSOs:
 - Promote technological interoperability
 - Coordinate standard development and promotion
 - Address hold-out problem inherent in standards
 - Enable access to standard through (F)RAND licensing commitments
- How are standards set by SSOs?
- Who participates in standard setting process? What is the role of private companies (rent-seeking)?

Internet Engineering Task Force

- IETF is the main forum for internet protocol development
- Anyone can participate. In practice, corporate, academic and individual engineers, and computer scientists
- Main motivation: Advance technology
- Largely decentralized platform, with exceptions: Area Directors expected to block projects that are in conflict with each other
- Transparent process \Rightarrow rich data
 - Repository with every version of every project (success and failure)
 - E-mail server where project-related communication occurs
 - Tri-annual meetings, held around the world

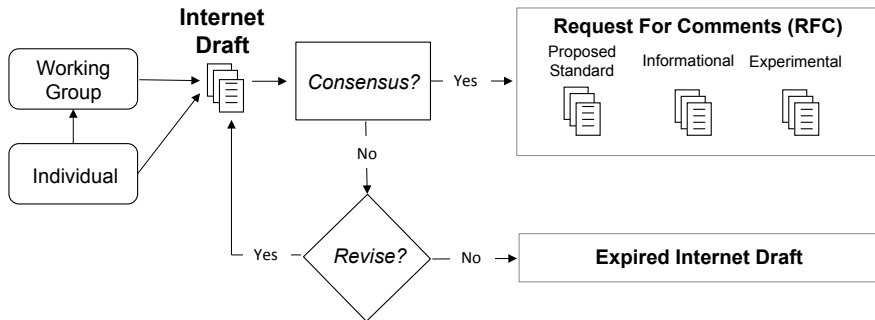
IETF Protocol Examples

	Description	Year
RTP	Real-time Transport Protocol	2003
SIP	Session Initiation Protocol	2002
HTTP	Hypertext Transfer Protocol	1999
IPV6	Internet Protocol, Version 6 (IPv6)	1998
DHCP	Dynamic Host Configuration Protocol	1997
POP3	Post Office Protocol – Version 3	1996
NAT	Network Address Translator	1994
FTP	File Transfer Protocol	1985
TCP	Transmission Control Protocol	1981
IP	Internet Protocol	1981

Major Contributors

<u>1992-1994</u>		<u>1992-2004</u>	
1. Cisco	94	1. Cisco	1,787
2. Carnegie Mellon	51	2. Nortel	694
3. mtview.ca.us	48	3. Microsoft	581
4. IBM	44	4. Nokia	539
5. SNMP Research	38	5. Sun Microsystems	513
<u>1995-1997</u>			
1. Cisco	214	6. AT&T	513
2. IBM	140	7. IBM	490
3. Microsoft	140	8. Ericsson	398
4. Sun Microsystems	84	9. Lucent	343
5. USC (ISI)	79	10. Bell Labs	301
<u>1998-2000</u>			
1. Cisco	517	11. Alcatel	299
2. Nortel	321	12. Juniper Networks	260
3. AT&T	223	13. Intel	225
4. Microsoft	221	14. Columbia U.	220
5. Sun Microsystems	180	15. Siemens	200
<u>2001-2004</u>			
1. Cisco	962	16. Dynamicsoft	196
2. Nokia	404	17. USC (ISI)	195
3. Nortel	354	18. ACM	185
4. Ericsson	279	19. MIT	152
5. Sun Microsystems	234	20. NTT	149

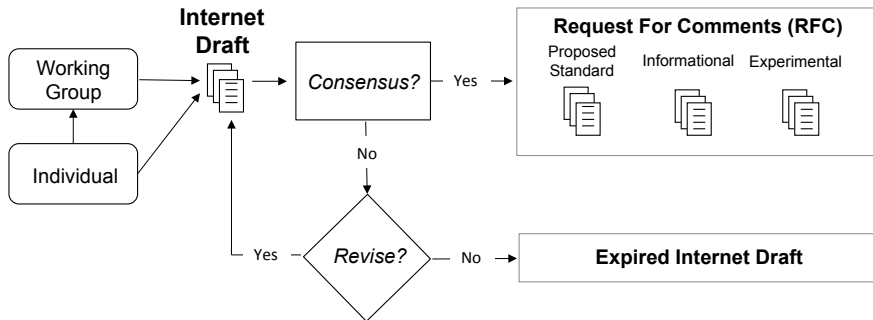
IETF Standardization



1. Identify problem and submit proposal (Internet Draft or ID)

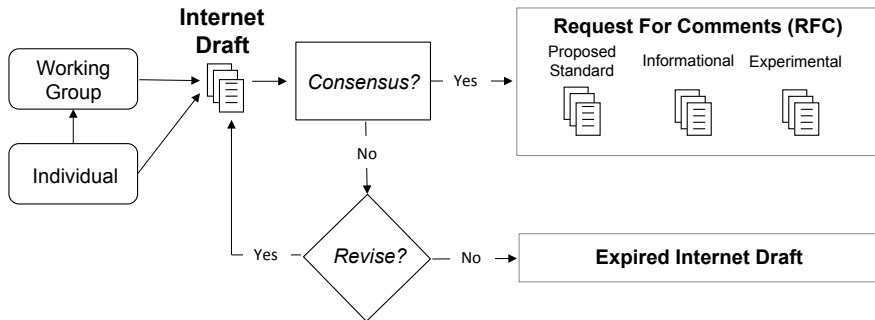
- Two types: Individual and Working Group
- Two tracks: standards and non-standards
- All projects posted to public repository

IETF Standardization



2. Community feedback via email and meetings

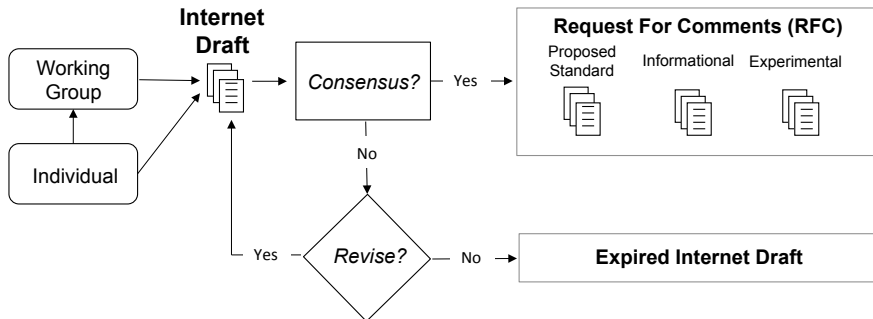
IETF Standardization



3. **Rough consensus** \Rightarrow ID published

- Decision by WG Chair and IESG (*de facto* super-majority)
- IETF guidelines: *"strongly held objections must be debated until most people are satisfied that these objections are wrong"*
- Published ID's called Proposed Standards (or RFCs)

IETF Standardization



4. No consensus \Rightarrow sponsors have a choice

- **Revise** ID \rightarrow return to step (1) [submit revision]
- **Abandon** ID \rightarrow expires in 6 months

SEPs

- Which patents are included in standards?
- Patents become SEPs through bona fide self-declarations (+ negotiation)
- When are patents included? When are they officially listed?
- How “essential” are the patents included?
- Ex post disagreement over validity of patent and standard essentiality

IEEE Standards

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, **no position is taken with respect to the existence or validity of any patent rights** in connection therewith. A patent holder or patent applicant has filed a statement of assurance that it will **grant licenses under these rights without compensation or under reasonable rates**, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses. **Other Essential Patent Claims may exist for which a statement of assurance has not been received.** The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

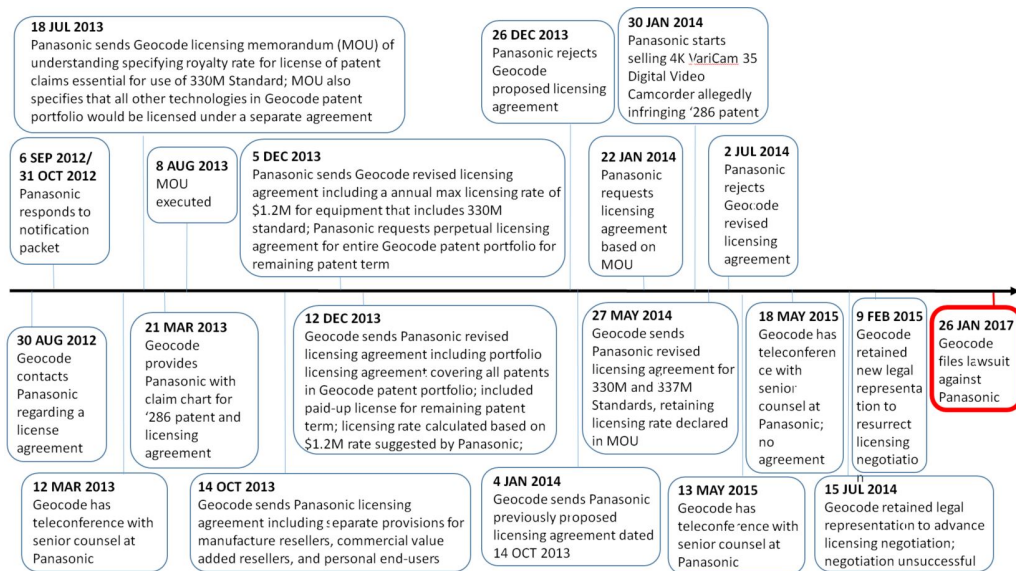
Hold-Up

- The basic **hold-up** problem:
 - 2 parties: 1 upstream firm and 1 downstream firm that uses technology produced by the upstream firm
 - Downstream firm makes “relationship-specific” investment
 - Upstream firm has incentive to exploit the investment
 - Before downstream firm makes investment, it negotiates contract with upstream firm
 - If contract not perfect, upstream firm will re-negotiate the contract after downstream firm has made sunk investment
- Result: upstream firm obtains larger share of surplus generated by the downstream firm than in negotiation before the investment was made
- Hold-up exists because SEP have strong monopoly power **ex post**
- Solution by SSOs is require loose commitment to (F)RAND licensing

Hold-Out

- The **hold-out** problem: Implementer attempts to avoid having to license the relevant SEPs
- In the extreme, hold-out implies implementer refuses a license unless forced by a court to accept one (often referred to as “efficient infringement” or “reverse hold-up”)
- SEP owner forced to engage in costly and lengthy litigation
 - Risk of invalidation
 - Non-essentiality
 - Implementation not covered by standard
- Result: lower royalty rate
- Potential repercussions for other subsequent licensing negotiations (comparable licenses)
- Global vs. national licenses
- Portfolio vs. individual SEPs

A Hold-Out Timeline



FRAND

- How is a FRAND license price determined in practice?
- Problem, ex post negotiations, ex ante determination of SEPs
- Value of standard exceeds value of individual patent – should the license reflect the value-added created by bundling patents in a standard?

FRAND

- How to define reasonable and non-discriminatory and then how to determine the appropriate FRAND royalty rate for an SEP or a portfolio of SEPs?
- Trade-off:
 - If FRAND is defined in a way that allows SEP owners to charge royalties that exceed the level appropriate for the patented technology, widespread adoption of standards and the associated economic benefits may be threatened
 - If FRAND is defined in a way that does not properly compensate an SEP owner for the value of the patented invention, current or prospective patent owners may choose not to participate in SSOs and inventors may have decreased incentives to innovate (especially relevant for standard development)
- In practice, *reasonable* is defined as an *ex ante* royalty: royalty that could have been obtained by the SEP owner at the time the standard was set

FRAND

- Ex ante incremental value of the SEP: what is the additional value provided by the SEP over the next-best substitute technology?
- Calculating the incremental value of the SEP requires translating the technical improvements into the monetary value of those improvements
- Benefits of SEP:
 - SEP technology offers benefit in performance (e.g. faster download speeds)
 - SEP technology offers cost-savings benefit (e.g. lower cost of provision of service)
- Appropriate calculation of incremental value takes into account market value of improvement and cost savings from avoiding design-around

FRAND

- How is this done in practice?
- 3 conceptually simple approaches:
 1. *Bottom-up approach*
 2. *Top-down approach*
 3. *Comparables approach*

FRAND: Bottom-Up Approach

- *Bottom-up approach*: measure the incremental value of the SEP by measuring the ex ante incremental value of the SEPs directly
- Identify set of alternatives that would have been available prior to standardization and then determine the incremental value of SEPs relative to alternatives
- Alternatives include any technological workaround that the SSO might have considered had the SEP in question not been available
- Hard to determine what alternatives at the time standard was set (or no alternative available)

FRAND: Top-Down Approach

- *Top-down approach*: apportion a total royalty burden to SEP
- Determine aggregate royalty burden charged for all SEPs
- Aggregate royalty burden divided among all SEPs (potentially taking into account differences in the relative value of SEPs)
- Assess aggregate royalty burden for all SEPs from an ex ante perspective (avoid any excessive value from ex post switching costs)
- Prior to standardization, maximum possible royalty burden equal to total economic profits that manufacturers expected from products compliant with the standard (safeguard against royalty stacking)

Top-Down Approach: Example

	Applications	Grants
All LTE SEPs	7,075	2,343
Samsung LTE SEPs	476	89
Samsung's LTE share	6.73%	3.80%
FRAND LTE	7%	7%
Per patent	0.001%	0.003%
For Samsung's portfolio	0.471%	0.266%

FRAND: Comparables Approach

- *Comparables approach*: pre-existing license or other market transaction as a benchmark
- Use comparable market transactions as benchmarks for the value of the SEPs in question
- But what is comparable? And how to adjust for differences?

Microsoft Corp. v. Motorola Mobility Inc. – District Court Western District of Washington

- Motorola sued Microsoft for patent infringement of SEPs for IEEE 802.11 WiFi standards and ITU H.264 video compression standards
- Ruling in favor of Microsoft in Sept. 2013 confirming the jury finding that Motorola had breached its RAND obligations (awarded \$14.5m in damages)
- Motorola had demanded a royalty of 2.25% of end product price and right to injunctive relief despite RAND obligation
- Microsoft's argument why Motorola had breached its RAND obligations:
 - Offering a royalty rate that was not RAND (offered 2.25% of end product price – Xbox and computers that run on Windows)
 - Seeking injunctive relief against Microsoft on the SEPs
- In April 2013, Judge Robert determined much lower royalty applying Georgia-Pacific Factors + ex ante incremental value approach (according to Microsoft royalties of \$1.8 million instead of \$4 billion annually)
- *[R]ewarding the SEP owner with any of the value of the standard itself would constitute hold-up value and be contrary to the purpose behind the RAND commitment.* (Judge Robert)

Samsung vs. Apple – US International Trade Commission

- Patentees can file complaint with US ITC alleging importation of infringing products (Section 337 of the 1930 Tariff Act)
- ITC is not entitled to award monetary damages but awards injunctive relief in form of exclusion orders enforced by US Customs and Border Control
- Samsung filed complaint against Apple
- ITC found in June 2013 that Apple's iPhone 4 and cellular iPads infringes Samsung's UMTS essential US Patent No. 7706348 (claims 75, 76, 82, 83, 84)
- The SEP enables Apple's devices to connect with the cellular network
- Despite small expected impact on Apple's sales (estimate 1%), issue triggered big debate because of standard essentiality
- Critical issues whether SEP infringed and standard essential (preliminary ITC ruling had cleared Apple) and whether Apple "unwilling" to license under Samsung's FRAND terms
- President Obama (US Trade Representative) vetoed in August 2013 ITC's exclusion order based on Samsung's commitment to FRAND licensing

Apple vs. Motorola – District Court Northern District of Illinois

- Apple asserted 4 patents, Motorola 1 SEP
- Motorola had asked for 0.9-1.125% royalty on Apple sales that infringe SEP
- Posner dismissed in June 2012 both parties' claims
- *There is another decisive objection to Motorola's damages claim. The proper method of computing a FRAND royalty starts with what the cost to the licensee would have been of obtaining, just before the patented invention was declared essential to compliance with the industry standard, a license for the function performed by the patent. That cost would be a measure of the value of the patent qua patent. But once a patent becomes essential to a standard, the patentee's bargaining power surges because a prospective licensee has no alternative to licensing the patent; he is at the patentee's mercy. The purpose of the FRAND requirements, the validity of which Motorola doesn't question, is to confine the patentee's royalty demand to the value conferred by the patent itself as distinct from the additional value—the hold-up value—conferred by the patent's being designated as standard-essential. (Judge Posner: 18).*

Summary

- Increased importance of standards and SEPs
- Plenty of unresolved issues surrounding selection of SEPs
- FRAND licensing problematic in practice
- Increased importance of standards for inter-connectivity (IoT)
- Will we see more or less SEP related litigation?