Nishith Desai Associates
LEGAL AND TAX COUNSELING WORLDWIDE

MUMBAI SILICON VALLEY BENGALURU SINGAPORE NEW DELHI NEW YORK GIFT CITY BOSTON

Research

Standard Essential Patents (SEPs)

Legal Frameworks, Licensing Challenges, and Strategy Implications

April 2026

Research

Standard Essential Patents (SEPs)

Legal Frameworks, Licensing Challenges, and Strategy Implications

April 2026

DMS Code: 150379.1

FT INNOVATIVE LAWYERS 2019
FINANCIAL TIMES
ASIA-PACIFIC WINNER

Ranked as the 'Most Innovative Indian Law Firm' in the prestigious FT Innovative Lawyers Asia Pacific Awards for multiple years. Also ranked amongst the 'Most Innovative Asia Pacific Law Firm' in these elite Financial Times Innovation rankings.

Chambers AND PARTNERS

IFLR1000

The LEGAL 500

BENCHMARK LITIGATION

asialaw

WWL

ASIAN LEGAL BUSINESS

INDIA BUSINESS LAW JOURNAL

INDIA BUSINESS LAW JOURNAL THE A LIST 2023 2024 LAW ASIA

INDIA BUSINESS LAW JOURNAL DEALMAKER 2023 LAW ASIA

Mergermarket An Acuris company

ITR WORLD TAX

iel ELITE

BUSINESS TODAY

THE NATIONAL LAW REVIEW

equalFi

ILA IDEX LEGAL AWARDS

LEGAL ERA BY THE PEOPLE. FOR THE PEOPLE. OF THE PEOPLE

LawWiser .com

Disclaimer

Contact

For any help or assistance please email us on **concierge@nishithdesai.com**
or visit us at **www.nishithdesai.com**.

Authors:

Nethravathi D
nethravathi.d@ipproinc.com

Patent Associate | Registered Patent Agent (India)
Nethra has over 13 years of experience in patent research and analytics. Her work focuses on infringement and invalidity analysis, freedom-to-operate assessments, and technology scouting across multiple technology domains.

Priyadarsini Shanmugam
priyadarsini.s@ipproinc.com

Head – Life Sciences | Attorney (India & California) | Patent Agent (India)
Priya has more than 17 years of intellectual property experience across patent firms, multinational companies, and global pharmaceutical organizations. She holds an LL.M. from UC Berkeley School of Law and a master's degree in biotechnology.

Contents

List of Abbreviations

Abbreviation	Meaning
SEP	Standard Essential Patent
FRAND	Fair, Reasonable, and Non-Discriminatory
SSO	Standard Setting Organization
3GPP	3rd Generation Partnership Project
ETSI	European Telecommunications Standards Institute
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
LTE	Long Term Evolution
5G	Fifth Generation Cellular Technology
SSPPU	Smallest Saleable Patent-Practicing Unit
EMVR	Entire Market Value Rule
ASI	Anti-Suit Injunction
AASI	Anti-Anti-Suit Injunction

Executive Summary

Standard Essential Patents (SEPs) play a foundational role in the global digital economy by enabling interoperable technologies across telecommunications, consumer electronics, automotive systems, and emerging connected devices.

SEPs are patents that protect technologies required to implement industry standards such as 4G, 5G, Wi-Fi, and video compression protocols. These standards enable interoperability across devices and networks, forming the backbone of the modern digital economy.

Because implementation of a standard requires the use of these patents, SEP holders commit to licensing them on Fair, Reasonable, and Non-Discriminatory (FRAND) terms. This commitment seeks to balance two competing objectives: rewarding innovators for technological contributions while ensuring broad market access to standardized technologies.

However, the SEP ecosystem has become increasingly complex. The expansion of connectivity technologies into sectors such as automotive, industrial IoT, and smart infrastructure has introduced new stakeholders who have limited experience navigating SEP licensing.

At the same time, global disputes over FRAND terms have intensified. Courts in the United States, European Union, United Kingdom, and China increasingly determine royalty rates, assess licensing conduct, and resolve cross-border SEP disputes.

Key challenges shaping the SEP landscape include:

- Determining fair royalty rates
- Addressing patent hold-up and patent hold-out behaviors
- Managing large patent thickets and cumulative royalty burdens
- Resolving disputes across multiple jurisdictions

As connectivity technologies expand into new industries, understanding the technological, legal, and economic dynamics of SEPs has become critical for innovators, implementers, and policymakers alike.

This report analyzes the technological, legal, and economic foundations of SEPs and examines the evolving global landscape of FRAND licensing and SEP litigation.

Introduction

The modern digital economy relies on globally interoperable technology standards. Whether enabling smartphones to connect to cellular networks, vehicles to communicate with infrastructure, or smart devices to exchange data, these standards ensure compatibility across billions of connected devices worldwide.

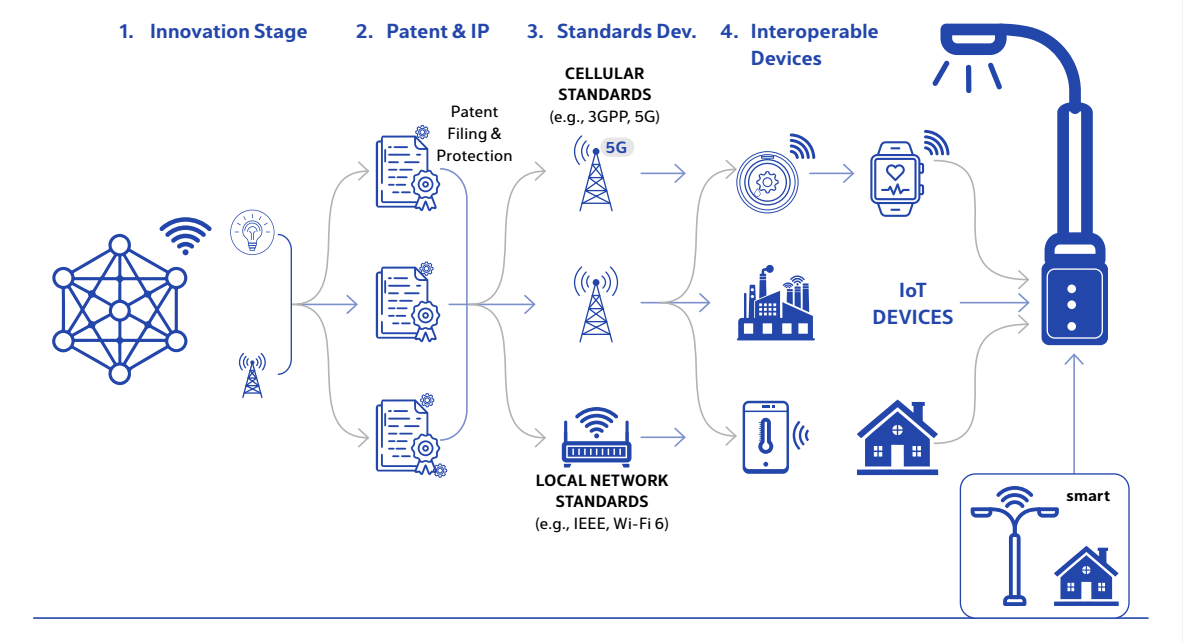


Figure 1: From Innovation to Interoperability – The Role of Standard Essential Patents in Global Technology Standards

Many of the technologies embedded in these standards are protected by patents. When a patented technology becomes indispensable for implementing a standard, the patent is referred to as a Standard Essential Patent (SEP).

Because implementers cannot comply with the standard without using these patents, SEP holders typically commit to licensing them on Fair, Reasonable, and Non-Discriminatory (FRAND) terms. This commitment is designed to ensure that standardized technologies remain widely accessible while preserving incentives for innovation.

1. Emergence of SEPs & Technology Standardization

A Standard Essential Patent (SEP) is a category of intellectual property that protects an invention considered necessary to comply with a specific technological or industry standard. These standards are typically developed by Standard Setting Organizations (SSOs), also known as Standards Development Organizations (SDOs), to ensure safety, interoperability, and compatibility across different products and services. Patent owners of SEPs typically declare their patents to the SSOs and commit to licensing them on FRAND terms.

SEPs covering fundamental technical standards such as 5G, Wi-Fi, and IoT are critically important to modern digital infrastructure. These patents protect the technologies that allow devices and systems developed by different manufacturers to communicate and operate seamlessly. Without such interoperability, products such as smartphones, routers, and connected devices would not be able to function reliably within global networks. These patents protect the specific, necessary inventions that allow different devices and systems from various manufacturers around the world to seamlessly communicate and function together, a concept known as interoperability. Without SEPs, for example, a smartphone from one company might not connect to a 5G network or a Wi-Fi router from another, crippling the user experience and fragmenting the global market. To prevent a single patent holder from blocking the implementation of a widely adopted standard, SEPs are generally licensed under Fair, Reasonable, and Non-Discriminatory (FRAND) terms.

This framework seeks to balance two competing objectives: rewarding innovators for their research and development investments while ensuring that standardized technologies remain broadly accessible across the market. By ensuring all compliant companies can access core technology on equivalent terms, SEPs accelerate the development, mass production, and global diffusion of connected devices and digital services, forming the essential backbone of the digital economy.

These patents cover fundamental technologies, such as those used in Wi-Fi, 5G cellular communication, or certain video compression formats, which have been incorporated into industry-wide technical specifications by the SSOs. The designation of a patent as "essential" means that any manufacturer, often referred to as an implementer, seeking to develop a product compliant with the standard (such as a smartphone or laptop) must necessarily use the patented technology. Thus, making a license to the SEP unavoidable for market participation[1].

Key Differences Between Standard Essential Patents and Conventional Patents

Features	Standard Essential Patent (SEP)[2]	Regular Patent (Non-SEP)
Essentiality to Standard	Mandatory Use. The patent's technology is essential to the standard, meaning a product cannot comply with the standard (e.g., be a 5G phone or a Wi-Fi device) without infringing the patent.	Optional Use. The patent's technology is not required by an industry standard. Implementers have the option to use it or to "design around" the patent.
Technical Specifications Link	The claims of the patent are explicitly mapped to, or "read on," the technical requirements of an industry standard developed by the SSO.	The patent claims protect an invention in any field, independent of its inclusion in a formalized industry standard.
Licensing Obligation	Typically comes with a commitment to license the technology on FRAND terms to prevent the patent holder from holding up the entire industry.	The patent holder has the absolute right to exclude others from using the invention and can license it on any terms they wish or not licensing it at all.
Market Power	Grants significant market power, as all market participants must use the technology to sell standard-compliant products.	Grants market power only over the specific invention, which can be circumvented by competitors.

1 https://www.wipo.int/en/web/patents/topics/sep.

2 https://www.gov.uk/guidance/standard-essential-patents-seps-explained.

2. Scope of this Research

Standard Essential Patents sit at the intersection of intellectual property law, technology standardization, and competition policy. Because SEPs protect technologies that are indispensable to implementing global standards, they create a unique legal and economic dynamic: while patent law grants exclusive rights to innovators, competition law seeks to ensure that these rights are not exercised in ways that restrict market access or harm downstream innovation.

I. Intellectual Property (IP) Law: Incentivizing Innovation

SEP Ecosystem Foundations

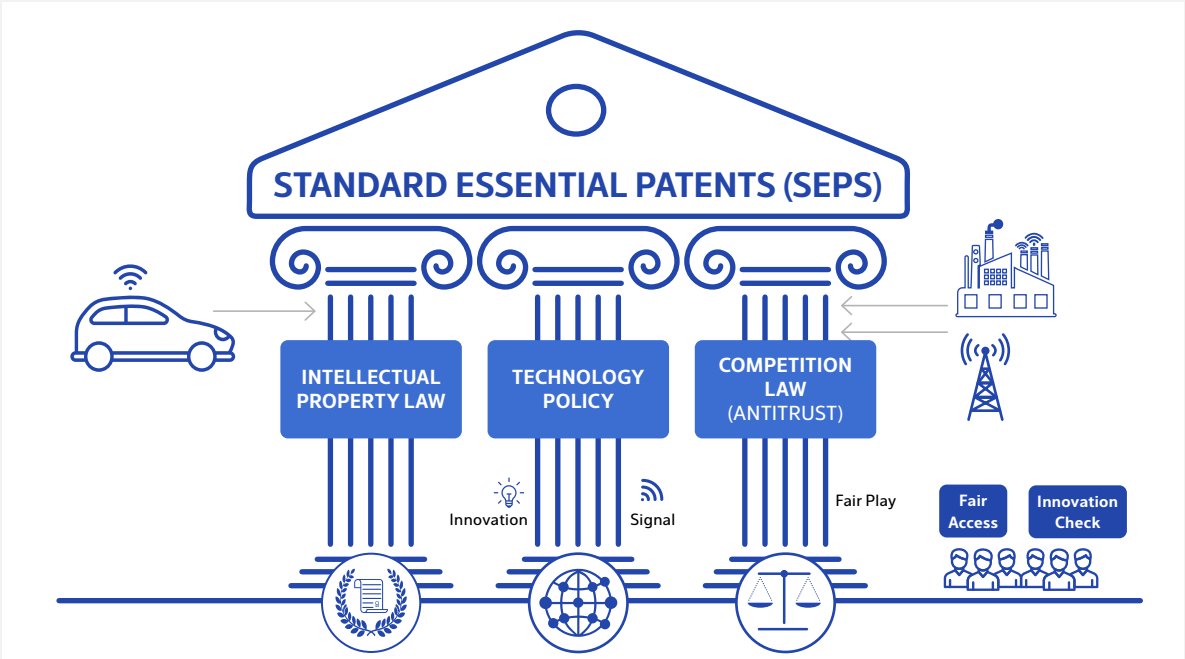


Figure 2: Institutional Foundations of the SEP Ecosystem

The relationship begins with IP Law, specifically patents, which serves as the foundational legal incentive for innovation. The core function of IP law is to grant inventors the exclusive right to their technological creations for a limited time, ensuring they can reap rewards for their R&D investments. In the case of SEPs, this right becomes particularly powerful because the patented technology is considered indispensable for implementing an industry standard. This exclusivity, however, also creates a potential dilemma: it is a legal monopoly granted over a technology that the entire industry must use to compete[3]

3 https://www.wipo.int/en/web/patents/topics/sep.

II. Technology Policy: Enabling Interoperable Standards

Technology policy, often implemented through the rules of Standard Setting Organizations (SSOs) such as ETSI and IEEE, establishes the institutional framework that enables technological cooperation and interoperability. The central goal of this policy is to ensure interoperability and facilitate the widespread diffusion of standardized technology, which benefits both consumers and the market. When an inventor submits a patent to be included in a standard, the SSO requires them to adopt an IPR Policy. This policy mandates that the SEP holder commit to licensing the essential technology to any interested party under the Non-Discriminatory (FRAND) terms. This commitment ensures that the exclusive right granted by law does not completely block market access, thereby safeguarding the policy goals of the standard itself[4].

III. Competition Law: Preventing Abuse of Market Power

The third pillar in this interplay, being Competition Law (or antitrust law), functions as the essential market check on the patent holder's power. Without regulatory counterweight, the SEP holder could exploit their position by engaging in "patent hold-up", demanding excessive royalties or unfair terms after the standard has been widely adopted by industry. Competition law steps in to prevent the abuse of a dominant market position. The primary tool for this enforcement is scrutinizing whether the SEP holder's licensing behavior, pricing, or refusal to license breaches the voluntary FRAND commitment. Therefore, courts and competition authorities are often tasked with determining the specific terms of a FRAND license, ensuring the SEP holder receives a fair return while technology implementers get fair access, ultimately promoting dynamic competition and consumer welfare[5].

The intersection of intellectual property law, competition policy, and technology standardization therefore requires a careful balance between innovation incentives and fair market access.

Strategic Insight

The economic significance of SEPs extends far beyond telecommunications! As connectivity becomes embedded in industries such as automotive, manufacturing, healthcare, and smart infrastructure, SEP licensing frameworks will increasingly shape the pace and cost of technological adoption.

3. Approach and Analytical Framework

I. Institutional Framework: SSOs and Judicial Interpretation

This report adopts a multidisciplinary analytical approach, combining legal analysis, technology policy review, and industry case studies. The objective is to examine how institutional rules established by Standard Setting Organizations interact with judicial interpretations of FRAND obligations across major jurisdictions.

4 https://www.uspto.gov/blog/standard-essential-patent-policy-and.

5 https://single-market-economy.ec.europa.eu/industry/strategy/intellectual-property/patent-protection-eu/standard-essential-patents_en.

A. Analysis of SSO Policies

This analysis focuses on the IPR Policies of major SSOs (like ETSI or IEEE).

- **Focus:** Standard Setting Organizations establish the institutional rules governing patent disclosure and FRAND licensing commitments. The analysis reviews how these policies define requirements for patent disclosure, the commitment to FRAND terms, and the mechanisms (or lack thereof) for verifying essentiality.
- **Purpose:** To establish the foundational contractual and ethical rules of the SEP game, highlighting the private law basis for licensing disputes.

B. Analysis of Key Court Rulings

This analysis involves a comparative study of landmark judicial decisions across key global jurisdictions.

- **Focus:** Courts play a critical role in interpreting and enforcing the FRAND commitment, particularly because most SSOs intentionally leave the precise meaning of FRAND undefined. The analysis examines how different jurisdictions define:
  - **Good Faith Negotiation:** The procedural steps required (e.g., the *Huawei v. ZTE* roadmap) to distinguish a "willing licensor" from an "unwilling licensee."
  - **FRAND Valuation:** The economic methodologies accepted (e.g., SSPPU, Top-Down approach) to calculate a reasonable royalty rate.
  - **Remedies:** The circumstances under which courts grant or deny injunctions (sales bans) against implementers of standardized technology.
- **Purpose:** To synthesize the current legal status of the FRAND standard, highlight jurisdictional conflicts (e.g., over global rate setting), and map the risks and strategies for both SEP holders and implementers.

II. Specification of the Technological Focus (e.g., Cellular Standards)

Given the vast number of technology standards that may involve SEPs, this report focuses primarily on cellular communication standards, particularly 4G LTE and 5G.

- **Rationale for Selection**:
  - **Economic Significance:** Cellular standards underpin the global smartphone industry as well as emerging sectors such as connected vehicles, industrial IoT, and smart infrastructure, making the related SEPs the most economically valuable and contested.
  - **Litigation Intensity:** The majority of high-profile SEP disputes, including cases involving Ericsson, Nokia, Qualcomm, Apple, and Huawei, arise from cellular communication standards.
  - **Complexity:** Cellular standards involve sophisticated patent stacking issues, debates over the licensing base (component vs. end-product), and intricate questions of essentiality, thus embodying all the core challenges of the SEP ecosystem.

By adopting this dual focus, viz., legal analysis across institutional rules and judicial decisions, centered on cellular technology, the research gains the requisite depth to provide substantial critique of the current SEP landscape.

Technological Foundations of Standard Essential Patents

Technology standards form the invisible infrastructure of the digital economy, enabling billions of devices and networks to communicate seamlessly across the world.

SEP Ecosystem Flow

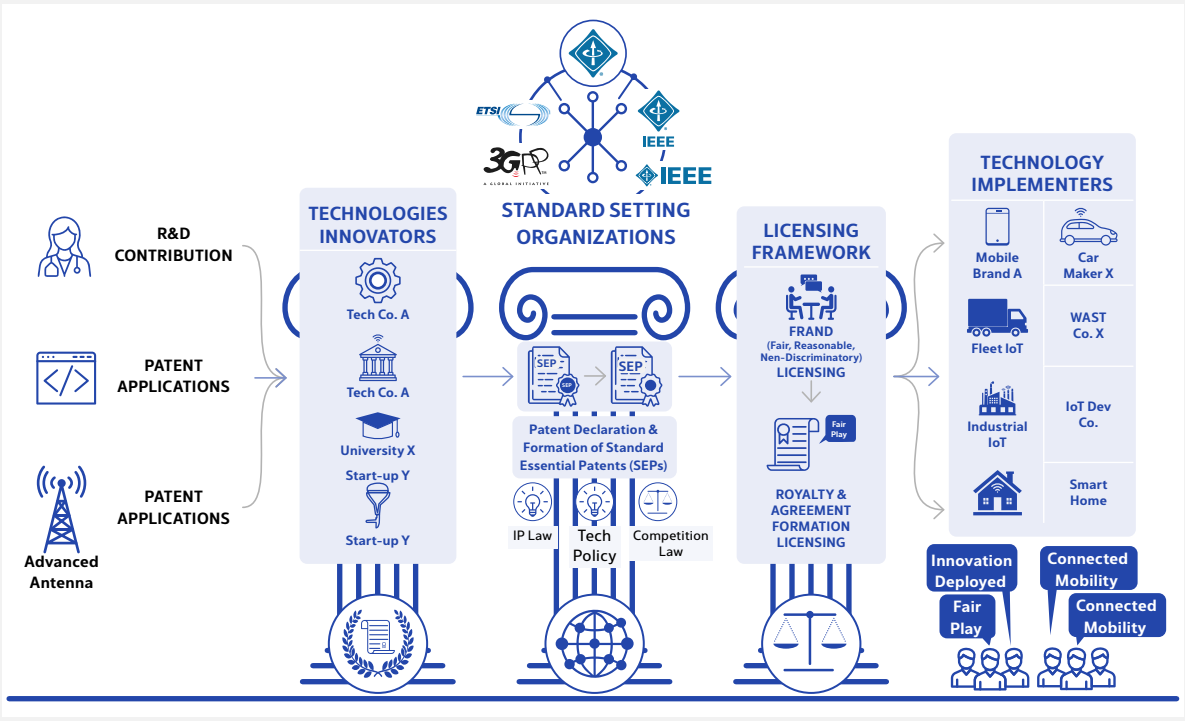


Figure 3: The Standard Essential Patent Ecosystem – From Innovation to Market Implementation

1. Standard Setting Organizations (SSOs): Role, Structure, and Procedures

The concept of Standard Essential Patents is closely linked to the process of technology standardization. Industry standards define the technical specifications that ensure interoperability between devices and networks. These standards are typically developed through collaborative processes involving manufacturers, technology developers, network operators, and research institutions. These standards define common technical specifications that ensure interoperability, quality, and safety across products and services.

The primary role of SSOs is to facilitate the development and maintenance of standards through a transparent, consensus-driven process, bringing together various stakeholders.

- **Promote Interoperability:** ensure that products developed by different manufacturers can operate seamlessly within the same technological ecosystem. A key illustration is 3GPP's global standards, which guarantees that any brand of smartphone can reliably connect and function with any mobile network across the globe[1].
- **Enable Economy of Scale:** By setting common specifications, SSOs enable manufacturers to mass-produce items, which ultimately translate into lower costs for consumers.
- **Encourage Competition and Innovation:** Standards create a reliable technological platform that reduces market risk for new entrants, allowing competition to focus on product features and pricing rather than on developing fundamental technologies.
- **Facilitate Global Trade:** Common international standards eliminate technical barriers, making it easier for goods and services to be traded across borders.
- **Address Societal Needs:** Standards often incorporate requirements for safety, quality, environmental sustainability, and security.

SSOs are non-profit entities that define the technical specifications necessary for global interoperability and technological advancement. Their organizational structures are generally hierarchical, built around technical and governance bodies. Crucially, their procedures emphasize a formal, consensus-driven process involving a wide range of global stakeholders to develop, approve, and maintain these standards.

Why Standardization Drives Global Technology Adoption

Technology standards create a shared technical foundation that enables interoperability across products and networks worldwide!

Without standardized protocols, devices produced by different manufacturers would not be able to communicate with each other reliably!

By aligning industry participants around common specifications, standardization reduces technological fragmentation, enables economies of scale, and accelerates global adoption of new technologies.

European Telecommunications Standards Institute (ETSI) is a globally recognized standards organization responsible for developing telecommunications and information and communications technology (ICT) standards used across Europe and internationally. While the General Assembly (GA) establishes the organization's strategic direction, specialized groups such as Technical Committees (TCs) and Industry Specification Groups (ISGs), composed of technical experts from industry and academia, conduct the core standards development work[2]. Final approval is given either by the relevant technical committees or through National Standardization Bodies for European Standards (ENs)[3]. ETSI's work spans crucial areas such as mobile communications (3G to 5G), radio systems, and cybersecurity, all aimed at promoting global interoperability, technological innovation, and competitive markets.

1 U.K. Gov't, Technical Standards and Standard Development Organisations, GOV.UK (Aug. 15, 2023),: https://www.gov.uk/government/publications/technical-standards-and-standard-development-organisations.

2 https://portal.etsi.org/People/ETSI-Organisation-Chart.

3 https://wraycastle.com/blogs/knowledge-base/etsi.

3rd Generation Partnership Project (3GPP) is a unique collaborative project, that unites seven regional Organizational Partners (OPs), including ETSI, ATIS (Alliance for Telecommunications Industry Solutions), and CCSA (China Communications Standards Association), to develop globally applicable mobile telecommunications specifications[4]. Governance and overall strategic coordination are managed by the Project Coordination Group (PCG), while the technical development is divided into three parallel streams, each overseen by Technical Specification Groups (TSGs) responsible for Radio Access Networks (RAN), Service & System Aspects (SA), and Core Network & Terminals (CT)[5]. Technical specifications are created through contributions from member companies in working groups, where proposals are first "agreed" and then formally "approved" at quarterly TSG Plenary meetings to be published as a definitive Release[6].

IEEE Standards Association (IEEE-SA) operates under a governance framework designed to ensure transparency, consensus-based decision-making, and due process in standard development[7]. High-level policy and financial oversight fall to the IEEE SA Board of Governors (BOG), while the IEEE SA Standards Board (SASB) coordinates all standards development and grants final approval[8]. Standards are drafted by Working Groups (WGs), which are open to participation by industry experts, researchers, and other stakeholders to ensure balanced representation of interests[9]. The formal approval procedure requires a Standards Association (SA) Ballot where the draft must achieve both a minimum participation threshold and supermajority approval rate (of about 75%); the successful ballot is then reviewed by the Standards Review Committee (RevCom) and the SASB before final publication[10].

Major Standard Setting Organizations in the SEP Ecosystem

Organization	Primary Role	Key Technologies
ETSI	Develops European telecommunications and ICT standards	4G, 5G, cybersecurity
3GPP	Develops global cellular communication specifications	3G, 4G LTE, 5G
IEEE	Develops global electrical and networking standards	Wi-Fi (802.11), Ethernet

I. The Consensus Process

The development of technology standards typically follows a consensus-driven process, which is a defining feature of organizations such as ETSI, 3GPP, and IEEE. This process ensures that the best technical solutions are adopted while mitigating the risk of patent holders exploiting their dominant position. The foundation of the process is consensus-based decision-making within technical working groups. Under this approach, standards are developed and approved when a broad group of stakeholders including technology developers, manufacturers, network operators, and researchers, reach substantial agreement on the technical specifications. This ensures both technical excellence and market acceptance[11].

4 https://www.3gpp.org/about-us/partners.
5 https://www.3gpp.org/3gpp-groups.
6 https://en.wikipedia.org/wiki/3GPP.
7 https://standards.ieee.org/wp-content/uploads/import/governance/audcom/baseline_pp-wg_simplified_individual.doc.
8 https://standards.ieee.org/wp-content/uploads/import/documents/other/sb_bylaws.pdf.
9 https://standards.ieee.org/wp-content/uploads/import/governance/audcom/baseline_pp-wg_simplified_individual.doc.
10 https://standards.ieee.org/wp-content/uploads/import/documents/other/ieee_sa_toolkit.pdf.
11 https://www.etsi.org/images/files/Education/Slideset_Understanding_ICT_Standardization.pdf.

Technical Selection Through Consensus

- **Voluntary Contribution**: Companies and individuals voluntarily propose their innovative technical solutions to solve a particular technical problem required for the standard (e.g., a specific method for radio transmission in 5G)[12].
- **Best Technical Solution**: The working groups evaluate all proposals based purely on technical merit and performance. The objective is to identify the most technically robust and efficient solution that fulfills the technical requirements of the standard.
- **Consensus to Adopt:** The technical solution is then incorporated into the draft standard and after achieving the required level of consensus (usually as substantial agreement, much more than a simple majority, but not necessarily an unanimity) among the working group members[13].

SEPs IPR Policy: A critical component of the standardization process is the intellectual property rights (IPR) policy adopted by SSOs. This is often mandated by the respective SDO's IP Policy.

A. Disclosure Obligation

- **Identify Potential SEPs**: Members of the SSO are generally required to disclose any patents or patent applications that may become essential to implementing the proposed standard[14].
- **Timing**: This disclosure usually takes place during the standard development phase, well before the final standard is ratified.

B. FRAND Commitment (The Balancing Act)

- **The Mandatory Pledge**: To balance the "Patent hold-up" risk and market power, SSOs typically require SEP owners to make an irrevocable commitment to license essential patents on Fair, Reasonable, and Non-Discriminatory (FRAND) terms.
- **The Consensus Condition**: The technical consensus to adopt the patented technology is implicitly conditioned on the patent holder making this FRAND commitment.

II. The Standardization Process: From technical contribution to standard adoption

During the development of a technology standard, multiple stakeholders may propose different technical solutions to address specific engineering challenges. Many of these technical solutions may be subject to patents or pending patent applications. To minimize the risk of anti-competitive conduct and potential hold-up, many SSOs have established the IP policy.

When patent owners contribute proprietary technical solutions to a standard, they commit to licensing their relevant patents to implementers, in accordance with the SSO's IP policy. These commitments may be of a general nature, without listing individual patents, or limited to individual patents or patent families specified by the SEP owner.

12 https://www.ericsson.com/en/reports-and-papers/white-papers/open-standards-together-we-innovate.

13 https://www.cambridge.org/core/books/law-and-practice-of-global-ict-standardization/policymaking-in-sdos/30E0EB41313C64B-B9AA87C9574E4D95B.

14 https://www.gov.uk/guidance/technical-standards-and-standard-development-organisations.

Once a technology standard is adopted, SEP owners generally become liable to license their SEPs to implementers under FRAND terms[15].

The development of a technology standard generally follows a structured sequence of stages, from initial technical contributions to final publication and global implementation.

Technology Standard Development Process

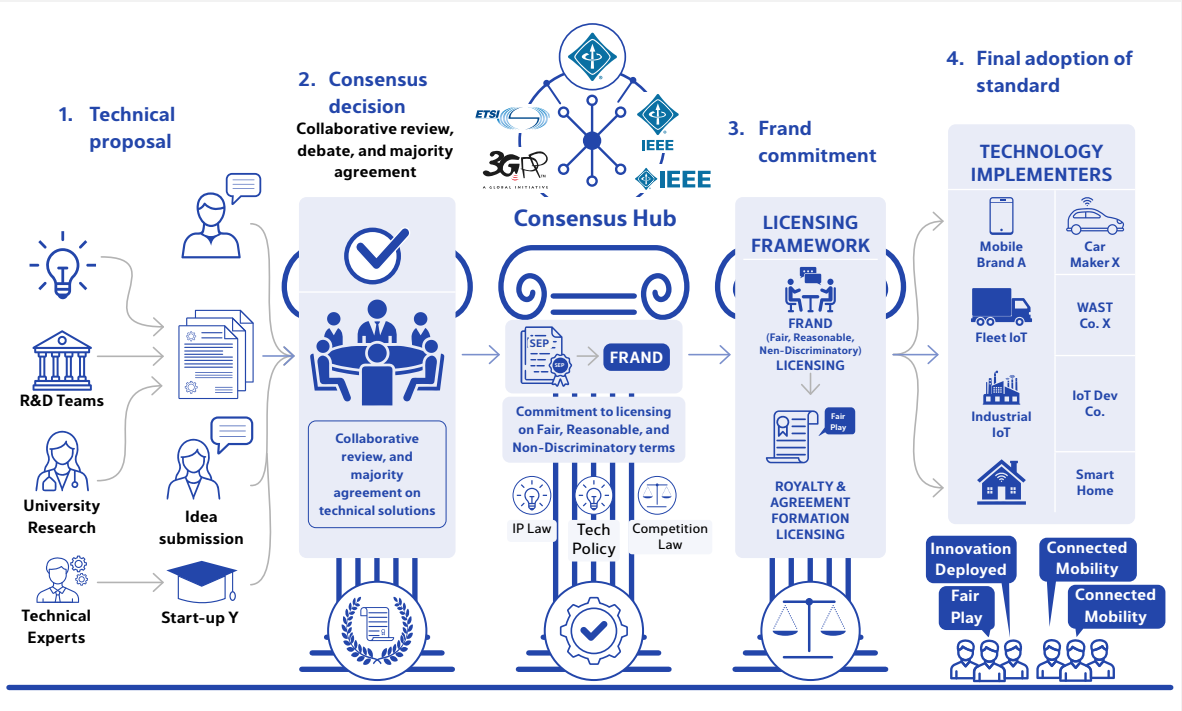


Figure 4: Technology Standard Development Process – From Technical Proposal to Standard Adoption

III. Technical Proposal Stage (Innovation & Contribution)

This stage focuses purely on identifying the best technological components to achieve the standard's overall goal (e.g., higher data speed, better power efficiency).

- **Standard Definition**: The SDO first defines a specific technical challenge or set of requirements
- **Voluntary Technical Contribution**: Member companies, research institutions, and technical experts propose their proprietary technical solutions to solve the defined problem. These contributions are usually based on the company's patent or patent-pending technology.
- **Initial Disclosure**: The SDO's IPR policy requires members to disclose any patents or patent applications they own that may become essential if the proposed technical solution is adopted into the standard. This disclosure is key to transparency[16].

15 https://www.wipo.int/en/web/patents/topics/sep.

16 https://ec.europa.eu/commission/presscorner/detail/es/qanda_23_2457#:~:text=For%20SEP%20holders%20the%20register,with%20other%20SEP%20holders'%20portfolios.

- **Technical Evaluation & Selection**: The SDO's working groups evaluate all submitted proposals based purely on technical merit, performance, and feasibility. The decision to incorporate a particular technology into the standard is typically based on consensus among participating technical experts.

IV. Specification Drafting Stage (Integration & Commitment)

In this stage, the chosen technical proposals are formalized, and the IPR commitment that defines a SEP is locked in.

- **Specification Drafting**: The working groups draft the technical specifications of the standard, integrating the selected technical proposals. This detailed document serves as the blueprint for all manufacturers. The language in the specification becomes critical, as it is against this text that a patent's essentiality is later determined.
- **Declaration of Essentiality & FRAND Commitment**: The owner of the patented technology that was incorporated into the draft standard must formally declare that their patent is essential to implement the technical specification. Crucially, as a condition of inclusion in the standard, the SEP holder must make an irrevocable commitment to license that patent to any implementer on FRAND terms.
- **IPR Policy Compliance**: This FRAND commitment is required by the SDO's IPR policy and is designed to counteract the 'patent hold-up' risk that arises when a patent becomes unavoidable due to its inclusion in a globally adopted standard[17].

V. Final Adoption Stage (Formalization & Publication)

- **Final Review and Approval**: The completed technical specifications, along with the assurance of the associated FRAND commitments, are submitted to the SDO's governing body (e.g., the Plenary or General Assembly) for final approval. This is typically achieved through a final consensus or supermajority vote.
- **Standard Publication**: Once approved, the Standard is formally published (e.g., as a 5G or Wi-Fi technical standard). At this point, the incorporated patents officially become SEPs[18].
- **Market Implementation**: The published standard is now ready for global implementation. Companies wishing to manufacture products that comply with the standard (e.g., smartphones, connected cars, IoT devices) must obtain a license for the relevant SEPs under the promised FRAND terms[19].

The timing of patent disclosure (prior to adoption) and the subsequent declaration of essentiality (near or post finalization) are critical procedural aspects within SSOs, impacting the transparency and fairness of the SEP framework. This process ensures that implementers are aware of potential SEPs early and that SEP holders commit to FRAND licensing terms.

17 https://ccijournal.in/index.php/ccijoclp/article/view/224/99#:~:text=According%20to%20the%20Competition%20Commission,Ericsson).

18 https://www.gov.uk/guidance/technical-standards-and-standard-development-organisations#:~:text=Once%20an%20SDO%20has%20approved,a%20new%20or%20revised%20standard.

19 https://www.patent-art.com/standard-essential-patents-sep/#:~:text=Therefore%2C%20usage%20of%20SEPs%20is,These%20policies%20comprise%3A.

Why SEPs are Strategically Valuable

Unlike conventional patents, Standard Essential Patents are embedded within widely adopted technology standards!

Once a standard is implemented across an industry, companies that manufacture compliant products must obtain licenses to the relevant SEPs!

This creates a unique economic dynamic in which SEP holders gain significant licensing leverage while implementers require access to these technologies to remain competitive.

2. Evolution of SEPs in Key Technologies

The evolution of cellular technologies from 3G to 5G illustrates how the scope and complexity of Standard Essential Patents have expanded over time. Each generation of mobile communication standards introduces new technical capabilities while simultaneously increasing the number of patents required to implement these technologies.

Industry studies estimate that the 5G standard may involve more than 100,000 declared patent families, making it one of the most complex intellectual property landscapes in modern technology.

Mobile Standards Evolution & Application

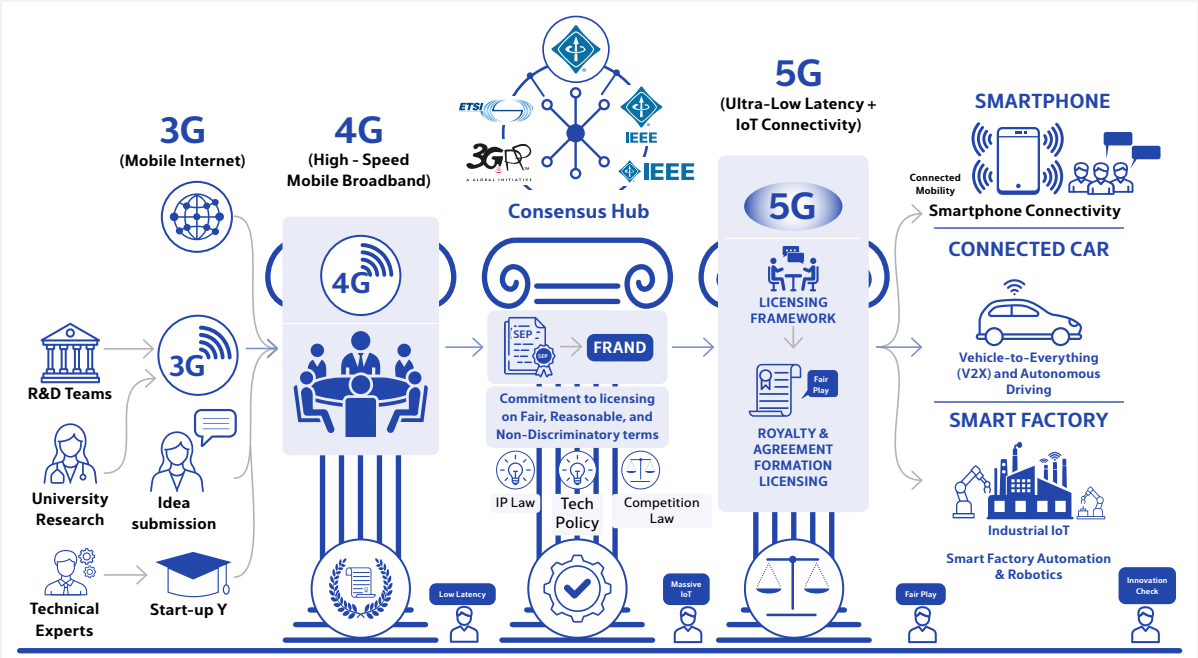


Figure 5: Evolution of Mobile Technology Standards and the Expansion of Standard Essential Patents

I. Cellular Communications: 3G, 4G, and 5G

The transition from 3G to 5G provides a clear illustration of how the SEP landscape has evolved alongside advances in wireless communication technologies. Each new generation introduces a greater number of foundational technologies and patents, significantly escalating the licensing challenge and expanding its impact across diverse industrial sectors.

The cellular generations are standardized primarily by the 3rd Generation Partnership Project (3GPP), which relies on contributions from leading technology companies. These standards are underpinned by thousands of SEPs.

Generation	Key Technical Advance	Core Technologies Covered by SEPs	SEP Landscape Evolution
3G (UMTS, W-CDMA)	Introduction of Mobile Internet/Broadband	Code Division Multiple Access (CDMA), packet-switched data, HSPA (3.5G) enhancements	Established the precedent for SEPs and the FRAND licensing commitment as critical for standard adoption.
4G (LTE, LTE-Advanced)	True High-Speed Mobile Broadband, All-IP Network	OFDMA/SC-FDMA, MIMO (Multiple-Input Multiple-Output), Carrier Aggregation, flat core network architecture.	The volume of SEPs increased. Litigation became frequent, around the definition and application of FRAND terms. The smartphone era drove massive adoption centralizing SEP value in the handset.
5G (NR - New Radio)	Enhanced Mobile Broadband (eMBB), Ultra-Reliable Low-Latency Communications (URLLC), Massive Machine Type Communications (mMTC).	Massive MIMO, mmWave spectrum use, Beamforming, Network Slicing, Low-latency protocols.	Explosion in SEP volume and complexity. Technology is essential for the next wave of industrial automation (URLLC) and vast device connectivity (mMTC), fundamentally changing the licensing landscape.

The core challenge across generations is the need to balance for adoption of interoperable standards. The evolving scope of SEPs are fundamentally changing due to the proliferation of connectivity technologies like 4G and 5G into sectors beyond traditional mobile phones, notably the Automotive Industry (Connected Cars) and a vast array of IoT products.

This evolution creates significant legal, commercial, and technical challenges, primarily centered around applying the established FRAND licensing commitment to new multi-tiered value chains.

II. Automotive Industry (Connected Cars)

Modern automobiles increasingly function as highly connected digital systems and are often described as “computers on wheels.” Technologies such as GPS navigation, advanced driver assistance systems (ADAS), infotainment platforms, and Vehicle-to-Everything (V2X) communication rely heavily on wireless communication standards, making numerous SEPs essential to the operation of connected vehicles.

Key Issues	Description and Challenges
New Licensees	The primary licensees are shifting from traditional ICT companies to automakers (OEMs), and their multi-tiered suppliers (Tier 1, Tier 2). Many automakers have historically had limited exposure to SEP licensing frameworks, which were traditionally concentrated within the telecommunications industry.
Licensing Level Debate	This is the highly contested issue. SEP holders generally prefer licensing at the end-product level (for example, the vehicle manufacturer), because the end-product's price provides a higher royalty base. The implementers (automakers and their suppliers) often argue that the license should be granted at the component level (e.g., the modem chip supplier). The landmark *Daimler vs. Nokia*[20] litigation brought this debate to the forefront.
Royalty Base and Value	Determining the Fair royalty rate is complex. A key question is whether royalties should be calculated based on the value of the connectivity component or the value of the entire vehicle (which offers services like autonomy, safety, and entertainment based on that chip)? The value of standard technology must be divorced from the value of the end-product's non-standard features.
Value Chain Complexity	Automotive supply chain is multi-layered and historically accustomed to component-level IP licensing, which conflicts with the telecom industry's history of end-device licensing[21].

III. Internet of Things (IoT) Products

IoT encompasses a wide range of connected products, including smart meters, wearables, home automation devices, and industrial sensors. This diversity significantly increases the complexity of SEP licensing across the IoT ecosystem[22].

Area of Evolution	Description and Challenges
Massive Scale & Low Value	IoT involves billions of low-cost, low-power devices (MMTC use-case under 5G). Applying a uniform royalty rate across all IoT devices is economically infeasible. This pressures SEP holders to develop differentiated, low-cost licensing models.
Product Diversity (SME Factor)	Implementers range from large technology companies to small-to-medium enterprises (SMEs) that have zero prior experience with complex global patent negotiations. A "one-size-fits-all" FRAND rate is impossible due to the huge variation in product function, price, and market.
Transparency and Stacking	Sheer volume of SEPs (adoption to 5G) makes it difficult for a small IoT manufacturer to know which patents are truly essential and what the total cumulative royalty burden ("royalty stacking") to be. This lack of transparency slows down adoption and increases risk of litigation.
"Field of Use" Licensing	SEP holders are exploring licenses that are differentiated based on the *field of use* (e.g., a lower rate for a cellular-enabled pet tracker than for a cellular-enabled industrial robot), though the "Non-Discriminatory" part of FRAND makes this legally challenging.

20 https://caselaw.4ipcouncil.com/germany/olg-karlsruhe/nokia-v-daimler.

21 https://www.jipitec.eu/jipitec/article/view/414.

22 https://www.cambridge.org/core/books/5g-and-beyond/how-to-create-a-smoother-sep-licensing-ecosystem-for-iot/BFA20E7504EA5B-88F5BB539FD2DFA7D3.

Strategic Insight

5G and future connectivity standards dramatically increase the number of patents required to implement a single technology platform.

This growing complexity intensifies licensing negotiations, increases litigation risks, and reinforces the importance of transparent FRAND licensing frameworks.

3. Assessment of Essentiality and its Challenges

Determining whether a patent is truly essential to a technical standard is inherently complex. A patent is generally considered essential if it is impossible to implement the standard without infringing at least one claim of that patent.

I. Claims Charting

Claim charting (mapping) is a structured technical and legal analysis used to determine whether a patent is essential to a technical standard. It establishes a direct, element-by-element link between the legal scope of the patent claims and the technical requirements of the standard specification. A claim chart is typically a structured table that compares each element of a patent claim with the corresponding technical specifications in the standard.

Role	Description
Verification of Essentiality	Primary goal is to prove that any product or method complying with the standard must necessarily infringe every single limitation (element) of the patent claim.
Basis for Licensing	Chart justifies the patent holder's assertion of essentiality, serving as crucial technical evidence during FRAND licensing negotiations.
Litigation Tool	In infringement lawsuits, the claim chart is the core exhibit that demonstrates how the defendant's standard-compliant product meets every element of the asserted patents' claim.

Claim charting is a methodical process that typically involves technical experts and patent attorneys working together:

Step 1: Understanding the Patent and Claim Construction

1. **Identify Key Claims**: Select the most relevant claims, usually the independent claims, as they define the broadest scope of the invention.
2. **Interpret Claim Scope (Claim Construction)**: Analyze the patent specification, drawings, and prosecution history to define the precise technical and legal meaning of every term and limitation in the chosen claim. This is a critical legal step that sets the boundary for the entire mapping exercise.

Step 2: Claim Decomposition

1. **Decompose the claim into individual technical elements**: The selected claim is broken down into its smallest, discrete structural, functional, or process elements. Each element is listed in the first column of the claim chart.

Step 3: Standard Analysis and Selection

1. **Identify the relevant technical specifications within the standard**: Determine which specific technical documents within the standard (e.g., specific 3GPP Technical Specifications, such as TS 38.213 for 5G) correspond to the technology of the patent.
2. **Target Functionality**: Locate the specific section(s), figures, flowcharts, or paragraphs in the standard that describe the functionality covered by the patent claim. For instance, if the patent is about a scheduling method, the analysis must focus on the scheduling procedures in the standard.

Step 4: The Mapping (Chart Generation)

1. **Element-to-Standard Mapping**: For each element identified in Step 2, the analyst must find a corresponding section, phrase, or requirement in the standard specification. This is the main body of the chart.
2. **Technical & Textual Correlation**: The chart must demonstrate a clear technical correspondence between the patent claim elements and the requirements of the standard.
3. **Documentation (Evidence of Use)**: In the adjacent column of the chart, cite the exact technical reference within the standard specification (e.g., TS 38.331) that explicitly describes the implementation of the patent element.

Step 5: Essentiality Conclusion and Verification

1. **The "All Elements Rule"**: The patent is considered technically essential if implementing the standard necessarily practices every element of the patent claim. If the standard offers alternative implementations that avoid one or more claim elements, the patent is not essential.
2. **Mandatory Features**: Ideally, the chart maps to mandatory, rather than optional, features of the standard, mapping to mandatory features of the standard generally provide stronger evidence of essentiality.[23]

23 https://lumenci.com/blogs/understanding-standard-essential-patents-claim-charts/.

II. Technical Complexity

Industry standards, particularly in Information and Communications Technology (ICT) sectors such as 4G and 5G, are extremely complex, spanning thousands of pages of technical specifications.

- **Massive Patent Portfolios**: A single standard may be associated with tens of thousands of declared patents families from numerous companies. Reviewing each patent claim against the entire standard specification requires specialized technical expertise and is a highly labor-intensive process, making it extremely costly and time-consuming.
- **Mapping Challenge**: Determining essentiality requires a detailed "claim chart" mapping, between patent claims and the standard's technical specification. This is often subjective and open to interpretation.

III. Over-Declaration

Patent holders participating in SSOs are generally required to declare patents that may potentially become essential to standard. Due to ambiguity, evolving standards, and an incentive to strengthen their licensing position, companies often "over-declare" patents.

- **Self-Assessment**: These declarations are typically based on self-assessment and are rarely subject to systematic verifications.
- **Non-Essential Patents**: Studies and litigation have shown that a significant percentage of declared SEPs are, in fact, not truly essential. This forces implementers (licensees) to challenge essentiality in court, incurring high legal costs just to determine which patents they truly need to license.

IV. Ambiguity in Standards and Patent Claims

The standard specifications are often developed through collaborative committee processes and may contain ambiguous, inconsistent, or flexible language. If the standard allows multiple alternative technical implementations to achieve a function, and a patent only covers one of those options, that patent is often considered non-essential because the standard can be implemented without it. Determining whether a standard's feature is mandatory or merely optional is critical but can be difficult based solely on the specification text.

A patent must be both essential to the standard and valid under patent law.

- **Claim Breadth**: Essentiality hinges directly on the patent claim language. If a claim is overly broad, it may be deemed essential but simultaneously faces a high risk of being invalidated due to existing prior art.
- **Validity Challenge**: A licensee often has to challenge both the essentiality and the validity of the patent, creating two separate, costly legal battles for a single licensing negotiation.

V. Lack of Centralized Assessment

Currently, no global authority conducts mandatory and independent assessments of SEP essentiality. Essentiality is determined primarily through:

1. **Self-Declaration** (by the patent holder to the SSO) and
2. **Bilateral Negotiation** (between the SEP holder and the implementer).

VI. Varying Judicial Interpretation

When disputes reach litigation, courts in different geographies may interpret the same patent claims and the technical standards differently, leading to inconsistent precedents across global markets. The lack of clarity on true essentiality is a primary driver of disputes over the FRAND terms.

VII. Licensing Leverage

Declaring a large number of potentially non-essential patents may strengthen a licensor's negotiating position during FRAND licensing negotiations.

- **Royalty Stacking Risk**: Implementers face this risk where the cumulative royalties from numerous SEPs are high that render the product commercially unviable. Without clear technical assessment, it's a challenge for implementers to calculate a fair aggregate royalty.

Uncertainty for Implementers: Determining which patents are truly essential and therefore royalty is an arduous, costly process that is often left to bilateral negotiation or fragmented judicial interpretation worldwide. This uncertainty forces companies either to challenge patents through costly litigation or to accept licensing terms that may include non-essential patent, which stifles innovation in downstream products.

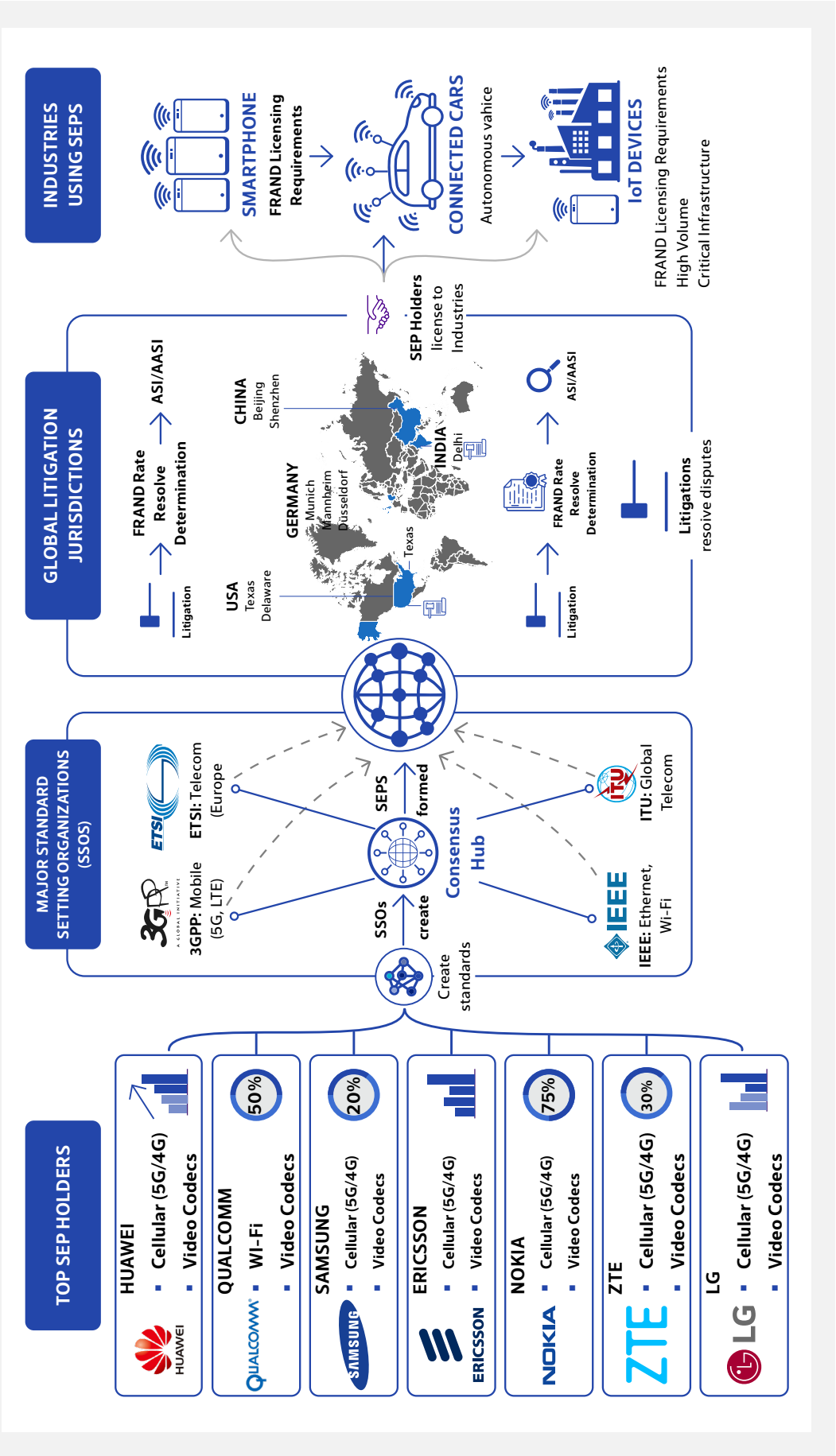


Figure 6: Global Standard Essential Patent Landscape – Key SEP Holders, Standard Setting Organizations, and Major Litigation Jurisdictions

Legal Framework Governing SEPs

The legal framework governing SEPs attempts to reconcile two competing objectives: protecting innovation incentives while ensuring fair access to technologies embedded in global standards.

1. Standardization's Paradox: IPR vs Interoperability

The relationship between intellectual property rights and technology standardization presents a fundamental policy tension. Patent law grants exclusive rights to innovators to encourage technological development, while standardization seeks broad adoption and interoperability across industries. This conflict is crystallized by SEPs which cover technology indispensable to a standard. Before technology becomes part of a widely adopted standard, the patent holder's market power is relatively limited. But once the technology is adopted, the SEP owner gains significant leverage, creating the risk of patent hold-up, wherein excessive licensing demands hinder the standard's widespread use and increase costs for the entire market.

Navigating The Tension: Patent Exclusivity vs. Standardization

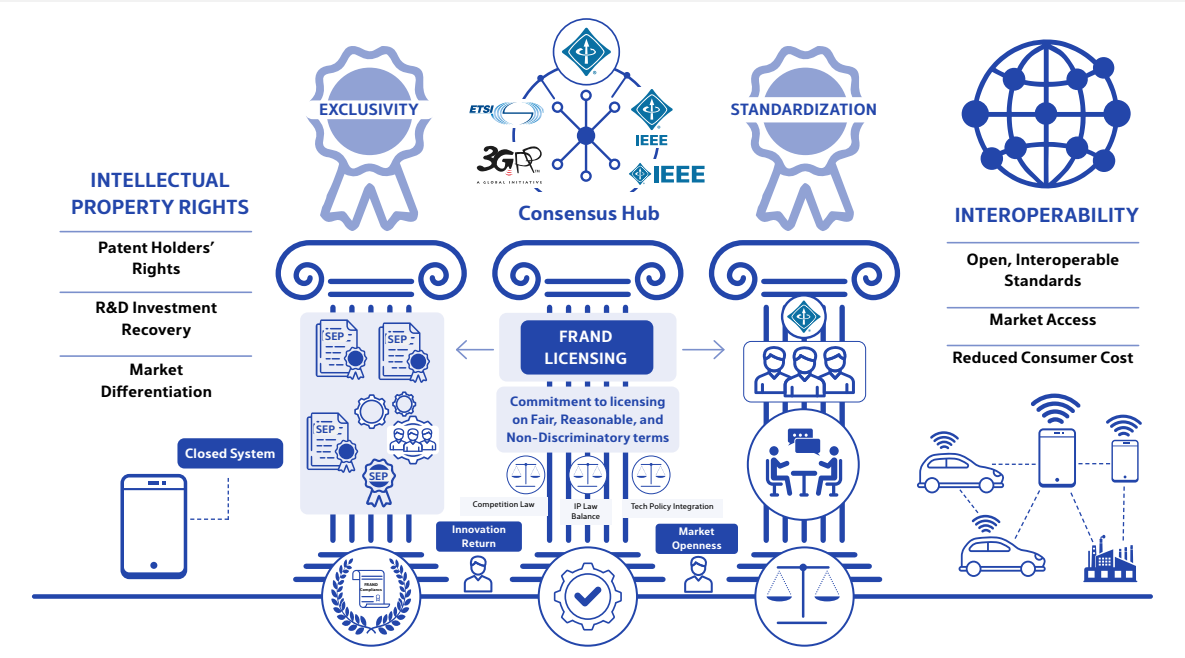


Figure 7: The Standardization Paradox – Balancing Patent Exclusivity and Industry Interoperability

2. FRAND Mechanisms to Mitigate the Tension

SSOs address this tension primarily through FRAND commitments. Most major SSOs require participants that contribute proprietary technologies to a standard to commit to licensing essential patents on FRAND terms. This commitment aims to balance innovation incentive with fair market access.[1]:

FRAND Element	Purpose
Fair	Royalty rates should reflect the intrinsic value of the patented technology rather than the additional market power gained from standard adoption.
Reasonable	Terms should be generally appropriate & not excessively restrictive, complex, or onerous (such as related to the scope of the license).
Non-Discriminatory	The SEP holder must offer comparable licensing terms to similarly situated implementers, without favoring certain licensees or excluding competitors.

I. Origin and Rationale of the FRAND Obligation

The FRAND obligation is typically a voluntary contractual commitment made by a patent holder when participating in a standard-setting process. The concept of non-discriminatory licensing has its origins in antitrust enforcement and regulatory policy, but its widespread adoption by SSOs today is a self-regulatory measure[2].

The FRAND commitment serves to incentivize innovation (by ensuring fair compensation) while simultaneously guaranteeing broad market adoption (by protecting implementers). Its primary rationale is to circumvent the risk of patent hold-up, which occurs when an SEP owner exploits the high switching costs of a standardized technology to demand monopolistic royalties far exceeding the technology's true value. By making this commitment, SEP holders provide assurances that essential technologies will remain accessible to all implementers.

II. Core Commitment to FRAND Licensing

The most common and significant ex-ante commitment is the obligation to license any SEPs on FRAND (or) Reasonable and Non-Discriminatory (RAND) terms[3].

The FRAND commitment is a crucial, voluntary, and legally binding declaration made by a patent holder to the SSO early in the standardization process (ex-ante). Its primary purpose is to prevent patent hold-up, which is the abusive market leverage an SEP owner would gain after standardization (ex-post) due to industry lock-in. By committing to FRAND terms before the technology is deemed essential, the patent holder effectively moves licensing negotiations to the competitive pre-standardization phase, ensuring broad and fair access to the essential technology.

1 https://www.cambridge.org/core/books/abs/competition-policy-and-intellectual-property-in-todays-global-economy/standardsetting-organizations-and-frand-licensing/71B6B037DB48ADBE141838957DFDC268.

2 Id at 6.

3 https://www.tandfonline.com/doi/full/10.1080/17441056.2022.2136852#d1e89.

In addition to FRAND licensing commitment, SSO policies mandate two other ex-ante actions from patent holders: the Disclosure Obligation, which requires them to notify the SSO of any potentially essential patents to allow members to make informed adoption decisions or choose alternatives and the Royalty-Free Option, where some SSOs may require or offer a commitment to license the SEP without charging royalties, especially for open or less complex standards.

III. Challenges of FRAND Licensing

Despite the FRAND commitment, disputes frequently arise because the precise meaning of "Fair" and "Reasonable" remains undefined.

- **Determining a "Fair" Rate**: The vast disparity between the royalty expectations of SEP holders and implementers inevitably leads to lengthy, costly negotiations and subsequent litigation across multiple global jurisdictions[4].
- **Patent Hold-Out**: Implementers may delay negotiations or challenge the validity or essentiality of patents in order to postpone licensing obligations[5].
- **Royalty Stacking**: When a single product incorporates dozens or hundreds of SEPs, the cumulative royalty burden may become so high that it undermines the commercial viability of the product.

The ex-ante commitment made by patent holders when participating in SSOs is a crucial component of IP policy designed to promote the widespread adoption of technical standards while ensuring fair access to the necessary patented technology.

Strategic Insight

Because FRAND terms are intentionally undefined by most Standard Setting Organizations, courts have increasingly become the institutions responsible for determining the economic boundaries of SEP licensing.

As a result, SEP disputes frequently evolve into complex global litigation strategies involving multiple jurisdictions

IV. The Mechanism of Patent Hold-Up

Patent Hold-Up arises from the lock-in effect created by technology standardization. Once a SEP is adopted into a widely used standard, companies that have invested in standard-compliant products often cannot switch to alternative technology. This lock-in gives the SEP holders opportunistic leverage *ex post* (after adoption) that they lacked *ex ante*, allowing them to demand excessive or abusive licensing terms that capture the value of the entire standard's adoption, rather than just the value of the patented technology itself.

4 https://www.hammurabisolomon.in/post/comprehensive-analysis-of-sep-litigation-understanding-anti-suit-injunctions-and-frand-licensing-in-#:~:text=Furthermore%2C%20the%20complexities%20surrounding%20SEP,%2Dup%20and%20hold%2Dout.

5 https://www.wipo.int/en/web/patents/topics/sep#:~:text=Such%20differences%20may%20result%20in,dispute%20resolution%20(ADR)%20mechanisms.

Licensing practices associated with patent hold-up may include Excessive Royalties, more than the pre-standardization value or basing fees on the final product price instead of the smallest saleable unit. They also include "Discriminatory Terms", by offering less favorable conditions to certain licensees. Finally, the potent Threat of Injunction is often leveraged by SEP holders to force a licensee to accept these unfairly high (supra-FRAND) royalty rates.

When patent hold-up is permitted to go unchecked, the resulting market failures are significant. Excessive royalties translate into increased production costs and higher prices for consumers. Furthermore, high licensing fees severely inhibit downstream innovation and discourage competition from new entrants. Most critically, this behavior undermines the standardization process itself, as the risk of monopolistic patent costs erodes industry's willingness to adopt standards, directly frustrating the goal of global interoperability.

Patent Hold-Up vs Patent Hold-Out

Concept	Description
Patent Hold-Up	Occurs when SEP holders exploit their position after standard adoption to demand excessive royalties.
Patent Hold-Out	Occurs when implementers delay licensing negotiations or challenge essentiality to avoid paying royalties.

Both behaviors undermine the balance that FRAND commitments are intended to preserve.

V. Interpretation of FRAND: Defining "Fair," "Reasonable," and "Non-Discriminatory"

Although FRAND commitments underpin modern technological standards, the precise meaning of FRAND is intentionally undefined by most SSOs and is a frequent subject of complex litigation globally. Courts are frequently required to determine FRAND royalty rate and terms by engaging in a hypothetical negotiation between a "willing licensor" and a "willing licensee"[6].

Fair/Reasonable (F or R)

These two terms are usually read together and relate primarily to the royalty rate and other commercial terms. The core principle is that SEP holders should receive compensation reflecting the incremental value of the patented technology over the next-best non-infringing alternative available *prior to* the adoption of the standard (the *ex-ante value*), and exclude the value created purely by the standard's adoption and the resulting market lock-in.

Key factors considered by courts for determining a Fair/Reasonable rate include:

- **The Smallest Salable Patent-Practicing Unit (SSPPU)**: Royalties should be based on the smallest component that practices the patented invention, not the value of the end-product (i.e., *the chip, not the smartphone*). This helps prevent the "entire market value rule" from inappropriately inflating the royalty base.

6 Id at 30.

- **Total Cumulative Royalty Burden (Royalty Stacking)**: The aggregate royalties for *all* SEPs in a standard should not make the standard prohibitively expensive or financially unviable to implement.
- **Comparable Licenses**: Royalties from existing, non-disputed licenses for the same patent portfolio are often the best evidence of a FRAND rate.
- **Technical Contribution**: The significance of the SEP to the standard's overall functionality.

Non-Discriminatory (ND)

The ND element of FRAND ensures that SEP holders do not user their market position to disadvantage particular implementers. requirement does not necessarily mean that all licensees must pay identical royalty rates. Differences are often justified by[7]:

- **Volume**: Licensees who commit to greater volumes or have a larger market share may be offered lower per-unit rates.
- **Timing**: Early licensees may receive more favorable rates to encourage initial adoption of the standard.
- **Cross-Licensing**: A licensee who also owns SEPs and grants a reciprocal license to the licensor (cross-license) may receive a lower effective royalty rate.
- **Level of License**: A license for a component manufacturer may differ significantly from a license to an end-product manufacturer.

The ND element is primarily violated when an SEP holder offers deliberately disadvantageous terms to a competitor or to a party to distort competition in a downstream product market.

Frand Licensing Negotiation Process Flow

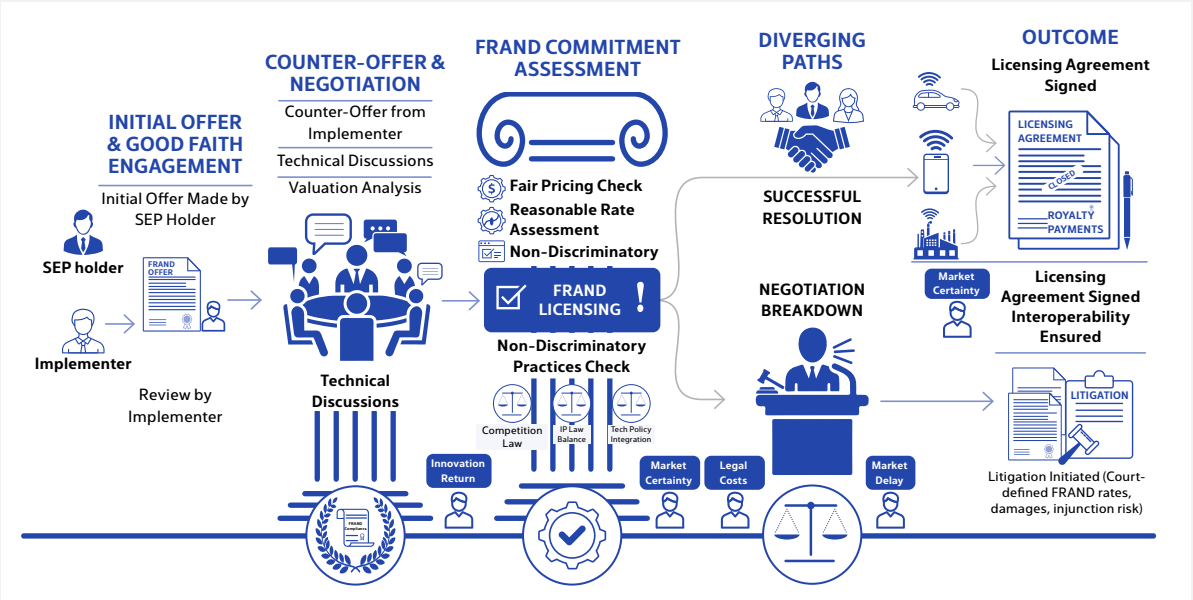


Figure 8: Typical FRAND Licensing Negotiation Process Between SEP Holders and Technology Implementers

7 https://lesi.org/article-of-the-month/non-discrimination-under-frand-commitmentone-size-fits-all-or-does-not-fit-at-all-23,24.

3. Competition Law Interface

I. Abuse of dominance, antitrust concerns, and the role of patent thickets.

The interaction between Competition Law (a.k.a. antitrust law) and SEPs represents one of the most heavily litigated areas in modern technology law. This interface exists because an SEP, by definition, may confer a form of market power because implementing the standard often requires use of the patented technology that is essential to be compliant with the standards. Competition law interjects to ensure this monopoly is not abused by way of harming market competition & consumers.

II. Abuse of Dominance and Antitrust Concerns

Market Dominance of SEPs

Dominance may arise because implementers cannot realistically design-around technologies that are essential to a standard. This automatic lock-in grants the SEP holder a dominant, quasi-monopolistic position in the relevant licensing market.

Antitrust Concerns and Patent Hold-Up

The core competition law concern is that an SEP holder will leverage its standard-enabled monopoly to engage in patent hold-up by demanding excessive royalties. Competition authorities in jurisdiction such as the European Union, the United States, and India scrutinize this as a potential abuse of dominance, which may take several forms:

- **Excessive or Unreasonable Pricing** violating the FRAND commitment.
- **Discriminatory Licensing** with terms favoring one competitor over another.
- **Refusal to License/Seeking Injunctions**: Using the threat of an injunction against a willing licensee who merely disputes the royalty rate.

In this context, the pursuit of injunctions is frequently seen by judicial and regulatory bodies as an abuse, given that the SEP holder's appropriate compensation is financial (royalties), not market exclusion.

III. The Role of Patent Thickets

Patent Thicket refers to a dense, overlapping web of IP (patents) that covers a single product or technology. While not exclusively related to SEPs, patent thickets pose serious antitrust concerns when combined with standardization:

- **Royalty Stacking**: In standards like 5G, a single connected device may use thousands of declared SEPs held by numerous different companies. Such patent thickets may lead to cumulative royalty obligations, commonly referred to as Royalty Stacking.

- **Impeding Competition**: These cumulative licensing costs may disproportionately affect SMEs, especially the new entrants. Their limited capacity to absorb the high total licensing costs or manage extensive potential litigation creates a chilling effect on both competition and innovation.
- **Obscuring Rights:** The patent thicket creates uncertainty by obscuring which patents are truly essential and valid. This obscurity escalates negotiation costs, which disproportionately benefits large, established market players and disadvantages new entrants.

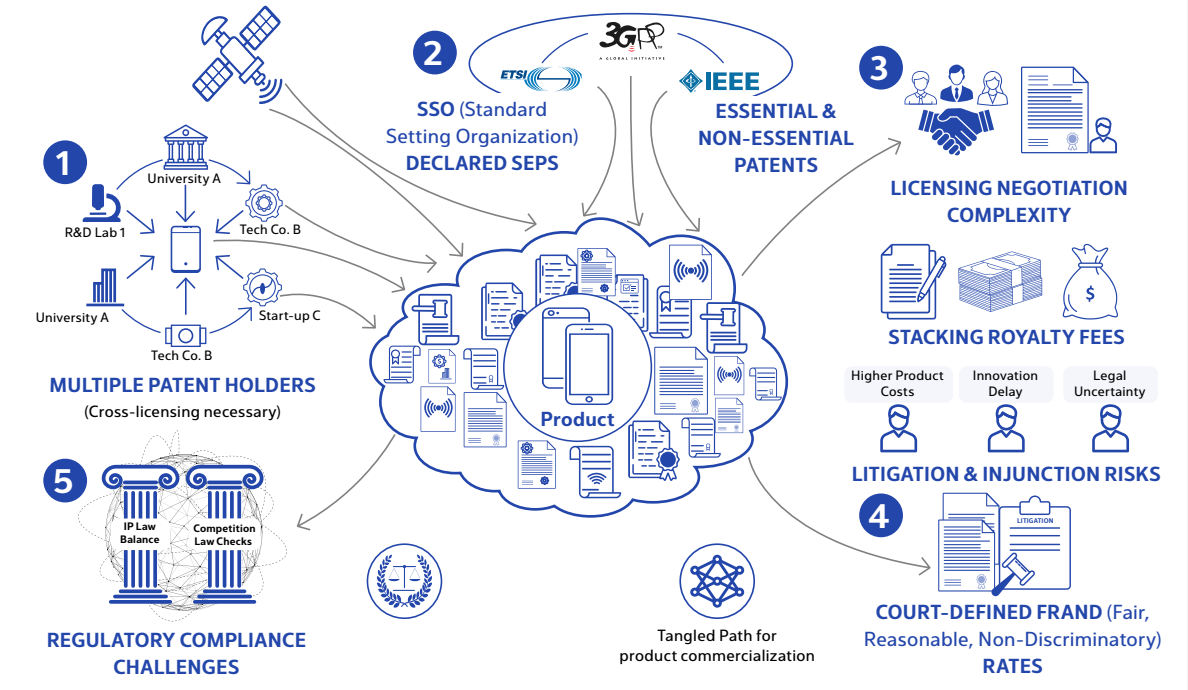


Figure 9: Patent Thickets and Royalty Stacking Risk in Standardized Technology Products

Competition law is critical in addressing these issues by imposing a check on the market power that SEPs and patent thickets confer, striving to protect the FRAND promise of fair access to standardized technology.

Companies like Qualcomm, Ericsson & Nokia, and InterDigital were primary architects of the standard and rely on SEP licensing as a core revenue stream. They contribute the most valuable patents to the thicket.

Company	Role in SEP Ecosystem	Strategic Goal
Qualcomm	Modem Technology Dominance. Holds a massive, highly valuable portfolio of SEPs for CDMA, 4G/LTE, and 5G baseband processors (the chips for cellular communication). This positions them at a critical chokepoint in the supply chain.	To structure licensing models that capture value from end-device manufactures (e.g., the smartphone price), which is a key source of the "royalty stacking" problem, and to use a "no license, no chips" strategy to maintain market control.
Ericsson & Nokia	Network Infrastructure. Hold large portfolios of SEPs related to the radio and core network standards. They are heavily dependent on patent licensing revenue to fund R&D for the next generation (6G).	To use litigation to force global device manufacturers into taking worldwide FRAND licenses, thus consolidating a revenue stream amidst the fragmented thicket.
InterDigital	Pure R&D/Licensing. Does not manufacture products but focuses solely on developing core technologies and securing SEPs, primarily in mobile communications and video.	To generate revenue primarily through licensing and enforcement of its SEP portfolio.

IV. The Role of Patent Pools

Patent pools provide an alternative licensing model that simplifies access to Standard-Essential Patents (SEPs). They replace multiple bilateral licensing negotiations with a centralized licensing framework. This structure involves an agreement where several SEP owners pool their patents relevant to an industry standard (such as a wireless or video codec) and appoint a pool administrator responsible for managing licensing and royalty distribution. This mechanism directly tackles the inherent inefficiencies of fragmented licensing, particularly the issues of cumulative royalty stacking and the high transaction expenses associated with separate negotiations with multiple parties[8].

Examples of SEP Patent Pool	Standard/Focus	Key Participating Companies (Licensors)
Avanci	Cellular (2G, 3G, 4G, 5G) for IoT/Automotive sectors Focus Strategy: Avanci offers a simplified licensing platform for cellular SEPs used in automotive and IoT devices.	Core Licensors: Ericsson (Founder), Qualcomm, InterDigital, Nokia, Samsung Electronics, Sharp, LG Electronics, Huawei.
MPEG LA	Video Codecs (MPEG-2, H.264/AVC, HEVC, etc.) Focus Strategy: This is the classic example of a successful pool, simplifying the licensing of fundamental video compression technology essential for media playback and streaming globally.	Core Licensors: Panasonic, Godo Kaisha IP Bridge, LG Electronics, Dolby Laboratories, Microsoft, Sony, Samsung Electronics, Google, Apple.
Sisvel	Wireless/Broadcast (Wi-Fi, DVB-T/T2, 3G/4G) Focus Strategy: Manages various patent programs, including a significant pool for Wi-Fi (802.11 standards) and digital television broadcasting, similar to how pools handle cellular tech.	Core Licensors: Siemens, Fraunhofer, Philips, Samsung, Nokia.
Access Advance	Video Codecs (HEVC, VVC/H.266) Focus Strategy: A competitor to MPEG LA's offerings, focusing on the newest and most advanced video compression standards (HEVC, VVC) that are essential for 4K/8K video streaming and broadcast.	Core Licensors: Samsung, Microsoft, Sony, Panasonic, Huawei.

Impact of Patent Pools on SEPs

Benefits for Implementers (Licensees)

Patent pools can create significantly reduce transaction costs and licensing complexity for companies that implement a standard, especially SMEs:

- **Simplified Licensing**: A licensee can obtain comprehensive access to all the pooled SEPs required for the standard through one negotiation and one license agreement thus saving time, legal fees, and administrative effort.
- **Reduced Litigation Risk**: A single pool license gains significant risk clearance and demonstrates a clear willingness to license for Implementers, crucial for defending against litigation by pool members.

8 https://iprd.evalueserve.com/blog/sep-patent-pools-transforming-ip-licensing-and-innovation/#:~:text=Patent%20holders%20joining%20a%20patent,Enhanced%20Innovation%3A.

- **Transparent and Uniform FRAND Terms**: Patent pools typically operate with predefined, public, and globally consistent licensing terms and royalty rates, in compliance with the "Non-Discriminatory" component of the FRAND commitment for predictable business planning.
- **Essentiality Vetting**: Successful patent pools often employ independent, third-party experts to evaluate patents for essentiality. This vetting process effectively screens out non-essential patents, improving the quality of the licensed portfolio and combating the issue of "over-declaration."

Benefits for SEP Holders (Licensors)

SEP owners also benefit greatly by joining a pool:

- **Increased Revenue and Market Reach**: Patent pools facilitate efficiency in reaching a broader licensee base, for new and small implementers who might otherwise eschew the standard due to licensing hurdles. This wider adoption translates directly into increased overall licensing revenue for the patent holder.
- **Lower Enforcement Costs**: The administrator handles the complex and costly tasks of negotiation, license management, monitoring, and royalty collection, allowing patent owners to focus on R&D rather than building expensive internal licensing and enforcement infrastructure.
- **Cross-Licensing and Freedom to Operate (FTO)**: For members, pooling their patents often provides them with immediate, cross-licensed access to all other patents in the pool, effectively granting them freedom to operate within the standard's requirements.

In summary, patent pools are a highly effective, pro-competitive mechanism for managing the inherent tension of SEPs under FRAND, facilitating broader adoption of standardized technology across multiple industries by lowering barriers and costs for all market participants.

Jurisprudence on SEPs and FRAND

Judicial decisions across multiple jurisdictions have played a critical role in defining the practical meaning of FRAND commitments and shaping the global SEP licensing landscape.

The interaction between intellectual property law and competition policy is most clearly reflected in the legal doctrines governing Standard Essential Patents. Judicial decisions have played a central role in shaping the practical application of FRAND obligations. As SEPs grant their holders a *de facto* monopoly over a standardized technology, the courts have become the crucial arbiters of fairness, tasked with ensuring that SEP rights are exercised in ways that preserve both innovation incentives and fair market competition.

1. Landmark Cases and Judicial Approaches

Ericsson v. Apple: This high-profile dispute emerged after the expiration of a long-standing cross-licensing agreement between Ericsson and Apple. This dispute involved parallel litigation across multiple jurisdictions across the US, Germany, the UK, and Latin America. Ericsson, the SEP holder, successfully leveraged the threat of preliminary sales injunctions in key markets like Colombia & Brazil to compel Apple, the implementer, to the bargaining table. The resulting threat of market exclusion and high legal costs ultimately forced a confidential, multi-year, global cross-licensing agreement, illustrating how the threat of injunctions can significantly influence SEP licensing negotiations[1].

Nokia v. Oppo: The dispute concerned licensing of Nokia's portfolio of cellular SEPs used in Oppo smartphones. Nokia aggressively pursued infringement claims across at least ten global jurisdictions. The dispute became critical in Germany, where Nokia secured injunctions that forced Oppo and its subsidiary, OnePlus, to cease smartphone sales. Oppo countered by challenging the royalty demands and seeking a judicial determination of a global FRAND rate in China. The commercial pressure from the ban on German sales ultimately compelled a settlement, resulting in a global patent cross-license agreement and catch-up payments to Nokia, further underscoring the commercial efficacy of injunctions[2].

Why Injunctions are Powerful in SEP Litigation

Injunctions remain one of the most powerful strategic tools in SEP litigation.

The threat of a sales ban in major markets can exert substantial commercial pressure on implementers, often forcing licensing negotiations or settlement agreements even before final court decisions.

1 https://www.ipwatchdog.com/wp-content/uploads/2021/12/Ericsson-v.-Apple-Complaint.pdf.

2 https://www.ijfmr.com/papers/2024/6/31800.pdf.

2. The Huawei v. ZTE: Framework for Good Faith SEP Licensing

The landmark judgement of the Court of Justice of the European Union (CJEU) in *Huawei v. ZET* established an important procedural framework for SEP licensing negotiation outlining a structured process for determining whether parties are acting in good faith conduct during SEP licensing negotiations. This framework is crucial because it determines when the SEP holder can seek an injunction without abusing its dominant position under EU competition law.

The ruling shifted the legal focus from a vague duty to negotiate to a set of clear, actionable steps that define a "willing licensor" versus an "unwilling licensee."

Party	Action Required	Impact on Good Faith
SEP Holder	Specific FRAND Offer: Must present a written, specific license offer, detailing the royalty rate and its calculation methodology.	This prevents the SEP holder from ambushing the implementer or making vague non-FRAND demands; it forces the negotiation to be concrete.
Implementer	Prompt, Reasoned Counteroffer: If the initial offer is rejected, the implementer must submit a specific, written FRAND counteroffer without undue delay. This counteroffer must be a genuine, substantiated attempt to conclude a license.	This prevents the implementer from engaging in "patent hold-out" (using the technology for free while delaying negotiations).
Implementer	Provision of Security: Must provide appropriate financial security (e.g., an escrow deposit) for past and future use of the patent during the dispute.	This protects the SEP holder's right to compensation and serves as a financial commitment demonstrating the implementer's genuine willingness to pay a FRAND rate.

Ultimately, a SEP holder can successfully pursue an injunction only if the implementer fails to diligently follow these steps (particularly failing to submit a *reasoned counteroffer (or) provide security*), thus classifying them as an unwilling licensee. This procedural clarity has become the dominant legal standard for assessing licensing conduct across Europe and influences courts globally[3].

3. Jurisdictional Definitions of "Willingness"

Courts across major jurisdictions have developed legal tests to determine who qualifies as a "willing licensor" and a "willing licensee" during SEP licensing negotiations. These definitions are primarily used to determine whether an SEP holder may obtain an injunction (a sales ban) against an implementer.

I. European Union/Germany (Procedural Focus)

The EU's standard, established by the Huawei v. ZTE (2015)[4] judgment and strongly applied by German courts, evaluates willingness primarily through compliance with the procedural negotiation framework defined by the court.

3 https://www.nortonrosefulbright.com/en/knowledge/publications/8f90efbd/the-eu-court-of-justice-judgment-in-huawei-v-zte---important-confirmation-of-practical-steps-to-be-taken-by-standard-essential-patent-holders-before-seeking-injunctions.

4 Id at 45.

- **Willing Licensor**: The SEP holder must initiate negotiations by providing written notice of infringement and presenting a specific FRAND licensing offer that clearly explains the proposed royalty rate and its calculation.
- **Willing Licensee**: The implementer must clearly and unequivocally express their willingness to license, submit a prompt and reasoned FRAND counteroffer (if the initial offer is rejected), and provide appropriate financial security (e.g., an escrow deposit) for the use of the patent during the dispute.
- **Outcome**: Failure by the implementer to follow these steps may result in implementer being classified as an unwilling licensee, making an injunction largely available to the SEP holder, as the implementer is seen as engaging in "hold-out." German courts, in particular, rigorously enforce the requirements for a reasoned counteroffer and security.

II. United States (Substantive Focus)

The United States approach, influenced by the supreme court's decision in *eBay Inc. v. MercExchange* (2006)[5], places less emphasis on procedure negotiation steps and greater emphasis on monetary remedies.

- **Willing Licensor/Willing Licensee**: The test is usually less about the steps of negotiation and more about whether the implementer is willing to compensate the SEP holder for the use of the patented technology through payment of a FRAND royalty.
- **Outcome**: US courts are generally reluctant to grant injunctions against implementers that demonstrate willingness to pay a FRAND royalty. The primary remedy is almost always a judicial determination of the FRAND rate (monetary damages), not a sales ban. The term "willing licensee" is thus broadly applied to any implementer who is not simply refusing to engage or pay compensation whatsoever.

III. China and India (Security Focus)

Courts in Jurisdictions such as China and India often place greater emphasis on the implementer's financial conduct during the dispute, specifically using security deposits as a key indicator of willingness.

China (Global Rate Setter): Chinese courts, particularly in rate-setting cases, often require the implementer to participate in the judicial process and accept the court's authority to determine the global FRAND rate. Failure to abide by procedural orders in the rate-setting case can classify a party as unwilling.

- In *OPPO v. Sharp* (Supreme People's Court, 2021)[6] confirmed that Chinese courts have the authority to decide a global FRAND rate, provided there is a substantial connection to China (e.g., the implementer is based in China, or the products are manufactured from there).
- In *Nokia v. OPPO* (Chongqing Intermediate People's Court, 2023)[7], the Chongqing court issued what is considered one of China's first decisions setting a worldwide 5G SEP rate, establishing its status as a global rate-setter.

India (Pro-Tem Royalty): Indian courts have explicitly ruled that a party claiming to be a willing licensee must provide a pro-tem security deposit (an interim royalty payment) to the SEP holder or a court-appointed escrow. This is deemed essential to prevent implementers from unjust enrichment while disputing the royalty rate, making the provision of security a prerequisite for being deemed "willing."

5 https://tile.loc.gov/storage-services/service/ll/usrep/usrep547/usrep547388/usrep547388.pdf.
6 https://ipo.org/wp-content/uploads/2023/04/ASI-whitepaper-final.pdf.
7 https://www.wipo.int/wipolex/en/text/594179.

- *Ericsson v. Micromax* (Delhi High Court, 2014): This landmark case saw the court direct the implementer, Micromax, to pay a royalty (based on Ericsson's last offered rate) as a condition for continuing to sell its mobile devices in India. This order firmly established the precedent for pro-tem deposits[8].
- *Dolby v. Lava International Limited* (Delhi High Court, 2024): The Delhi High Court ordered Lava to deposit over ₹20 crore (approximately $2.4 million) as pro-tem security for using Dolby's audio compression SEPs. The court found Lava to be a prima facie unwilling licensee due to its six-year delay in negotiations, constant requests for information without making a credible counteroffer, and general dilatory tactics. The security deposit was ordered specifically to protect Dolby's interests and remedy the years of unpaid usage[9].

4. Amazon v. InterDigital: The Ongoing Multi-territorial Litigation

This SEP litigation stands as a definitive case study in recent "jurisdictional escalation ladder," where patent enforcement has shifted from simple technical disputes to complex, multi-territorial procedural maneuvering. At the center of the conflict is a disagreement over SEP licensing for video compression technologies, which has evolved into a global struggle over which court has the authority to dictate worldwide FRAND royalty rates.

- **The UK Approach**: Amazon sought a global FRAND determination in the UK. The court granted an "interim license" (a temporary, court-set royalty) to prevent InterDigital from using injunctions as leverage to force settlements elsewhere.
- **The UPC/German Pushback**: The UPC and German courts issued the first "Anti-Interim-License Injunctions" (AILIs), arguing that the UK's interim license unfairly blocked patent holders from enforcing their property rights, and backed these orders with significant financial penalties.
- **The UK Response**: In a tactical countermove, the UK High Court granted an "anti-anti-suit injunction" (AASI), effectively restraining InterDigital from enforcing those foreign AILIs within the UK. The UK court framed this as necessary to protect the integrity of its own jurisdictional mandate and to prevent oppressive litigation conduct.

Increasingly, courts in major jurisdictions are asserting authority to set worldwide FRAND royalty rates and mandate financial security deposits. This trend moves the global landscape toward more predictable licensing terms, which is crucial for international trade and technology adoption. In essence, jurisprudence is essential for maintaining market stability, fostering innovation, and ensuring global interoperability by providing a necessary legal safety net for both SEP owners and technology implementers. However, the high-stakes divergence in cases like *Amazon v. InterDigital* illustrates a fundamental tension between global technology deployment and territorial patent enforcement, demonstrating that in today's digital economy, strategic procedural tools are often as decisive as the underlying patent merits themselves.

8 https://economictimes.indiatimes.com/industry/telecom/patent-row-delhi-high-court-asks-micromax-to-pay-royalty-to-ericsson/articleshow/45211413.cms.

9 https://www.casemine.com/judgement/in/68716b55ff0b307272b32d98.

Key Challenges in the SEP Ecosystem

Despite decades of policy development, the SEP ecosystem continues to face complex legal, economic, and technological challenges that influence licensing negotiations and industry adoption.

Licensing SEPs under FRAND terms presents several interconnected legal and economic challenges.

Strategic Insight

As connectivity technologies expand beyond smartphones into automotive systems, industrial platforms, and smart infrastructure, SEP licensing frameworks will increasingly influence

1. FRAND Royalty Determination

Determining an appropriate FRAND royalty remains one of the most complex challengers in SEP licensing. Royalty must reflect the true value of the patented technology, isolated from the monopoly value created by its inclusion in the standard (standard-locking effect).

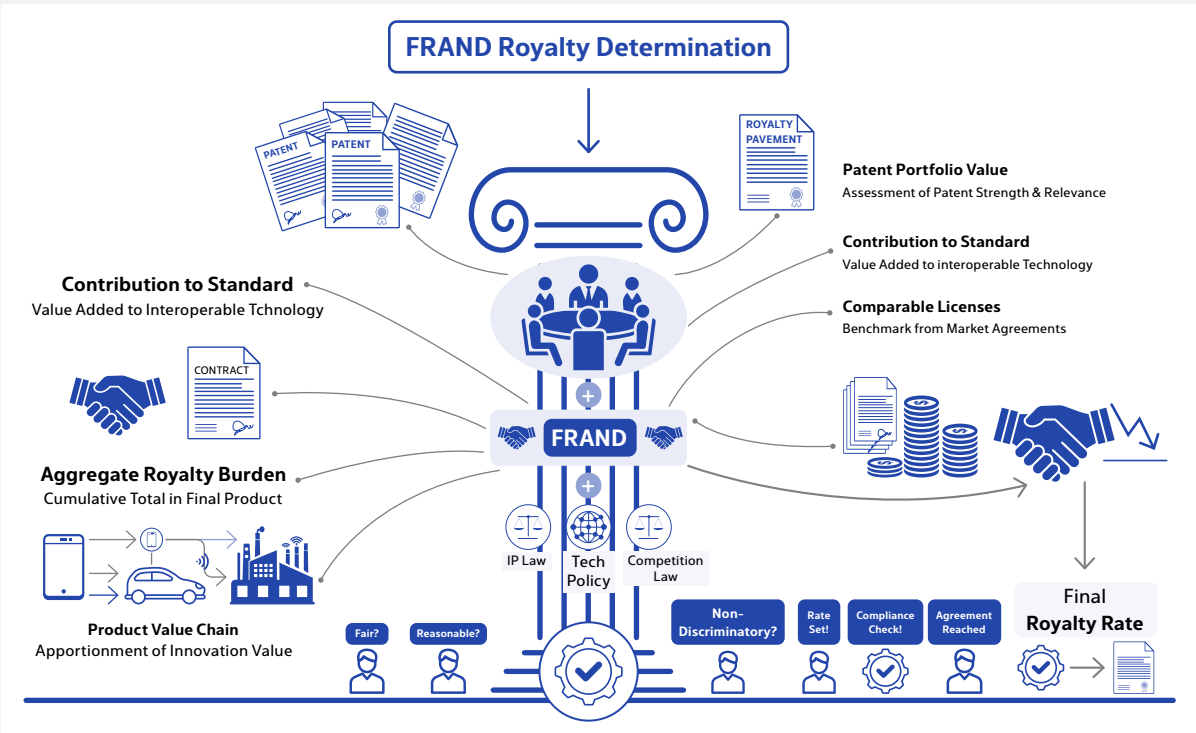


Figure 10: Royalty Rate Determination Process

I. Valuation Difficulties and Methodologies

Due to unavailability of genuinely comparable public license agreements, courts rely on theoretical models:

- **Top-Down Approach**: Estimates the aggregate royalty burden for all SEPs in a standard (e.g., 5G) and then apportions a share to the specific patent holder based on portfolio size or strength. The challenge is accurately estimating the total value the standard contributes to the end product.
- **Bottom-Up Approach**: Values the individual patent by analyzing its incremental economic benefit over the next-best non-infringing alternative. The method is often hampered by the scarcity of genuinely comparable public data.

II. The Challenge of Portfolio Licensing

Portfolio licensing is a single, global agreement covering thousands of SEPs, is efficient but generates significant opacity:

- **Valuation Opacity**: The bundled nature of the license makes it nearly impossible for the licensee to determine the value of specific patents, undermining their ability to challenge the validity or essentiality of individual weak patents.
- **Jurisdictional Conflict**: A single national court often dictates a worldwide royalty rate, creating friction with the fundamental principle that patent rights are territorial and governed by sovereign jurisdictions.

III. Debate over Licensing Base - Component vs. End-Product

The most contentious financial issue is whether royalties should be calculated on the price of the component or the end-product.

Concept	Royalty Base	Primary Rationale	Key Concern
Component Base (SSPPU)	The Smallest Salable Patent Practicing Unit (SSPPU), such as the chip or module.	Prevents Over-Compensation: Ensures the royalty reflects only the patented invention's incremental value, not the entire final product (e.g., the screen or brand value).	The percentage rate must be high enough to capture the full economic value of the invention.
End-Product Base (EMVR)	The full retail price of the final product sold to the consumer (e.g., phone, car).	Captures Full Economic Value: Argues the patented technology (e.g., 5G connectivity) drives consumer demand and simplifies accounting.	Risks Royalty Stacking and Patent Hold-Up; the cumulative royalty from thousands of SEPs could exceed the product's profit margin.

Courts generally favor the SSPPU as an evidentiary tool, holding that the Entire Market Value Rule (EMVR) is only applicable if the patented feature is the primary driver of consumer demand for the entire end-product.

Royalty Stacking: Cumulative Burden on A Single Device

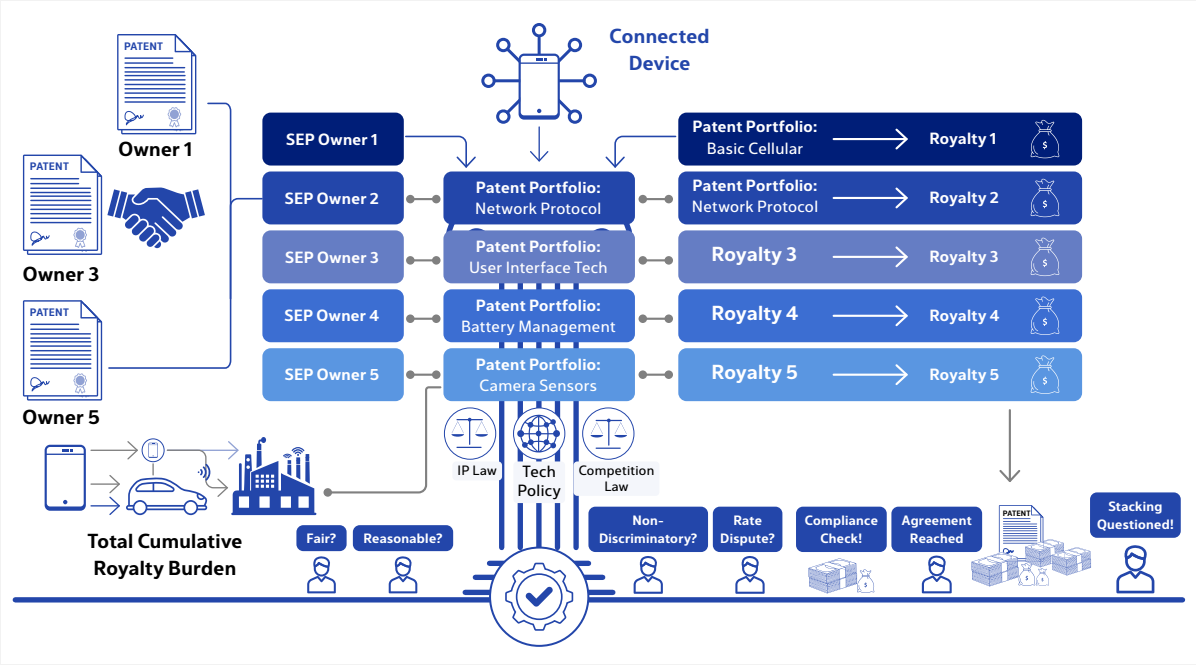


Figure 11: Royalty Stacking: Cumulative Burden on a Single Device

2. Licensing Disputes and Litigation

The ambiguity surrounding FRAND obligations frequently fuels multi-jurisdictional disputes, focusing on disputed royalty rates, challenges to essentiality, and defining willingness.

I. Multi-Jurisdictional Conflict and Judicial Tools

Global litigation involves strategic use of judicial tools to control the dispute's location and outcome:

A. Anti-Suit Injunctions (ASIs)

An ASI is a powerful court order issued by a court in one jurisdiction to prohibit a party (a litigant) from initiating or continuing parallel litigation in another country.

- **Mechanism**: An ASI doesn't directly order the foreign court to stop; it orders the party before the issuing court to cease the foreign action. If the party disobeys, they face contempt of court penalties in the issuing country.
- **Strategic Use**: An implementer (licensee) might sue the SEP owner in its preferred jurisdiction (say, the U.S.) to get a global FRAND rate determined and then seek an ASI to prevent the SEP owner from simultaneously suing them for infringement in Germany, China, or the UK—countries that might be more likely to grant an injunction.

- *TCL v. Ericsson* **(U.S.)**: TCL sought an ASI to prevent Ericsson from enforcing injunctions or pursuing parallel claims in other jurisdictions while the U.S. court determined the global FRAND rate[1].

B. Anti-Anti-Suit Injunctions (AASIs)

The AASI is a retaliatory countermeasure that represents the escalation of these jurisdictional conflicts.

- **Mechanism**: When a court (say A) issues an ASI, the party targeted by the ASI goes to a second court (say B, the court where the foreign case is filed) and asks it to issue an AASI. Court B's AASI prohibits the party from enforcing the ASI from Court A.
- **Result**: This creates a judicial standoff, or "trench warfare," where the parties are caught between conflicting orders from two different sovereign courts, creating immense legal uncertainty.
- *Xiaomi v. InterDigital* **(China/India)**: In this 2020 dispute, a Wuhan Intermediate People's Court in China issued an ASI preventing InterDigital from seeking litigation in India. An Indian court responded by issuing an AASI to protect its jurisdiction, showcasing the direct international friction caused by these tools[2].

C. Global Royalty Rate Setting

This is the most direct assertion of judicial sovereignty and a key source of international friction.

- **Concept**: Instead of just calculating infringement damages based on patents valid only in the local country, some courts assert the power to determine a single, binding worldwide FRAND royalty rate for the entire SEP portfolio.
- **Judicial Precedent (The UK)**: In the landmark case of *Unwired Planet v. Huawei (2020)*[3], the UK Supreme Court upheld the right of UK courts to set a global FRAND rate. The court ruled that if the implementer is found to infringe a UK patent and refuses to accept the court-determined global license, the UK court can grant an injunction banning the product from the UK market forcing implementers to accept the UK-set global rate.
- **Judicial Precedent (China)**: Chinese courts, particularly the Supreme People's Court (e.g., in *OPPO v. Sharp*[4]), have also asserted the authority to set global FRAND rates, often based on the principle that the underlying FRAND commitment is a contract dispute and should be settled comprehensively. This has led to the EU challenging China at the World Trade Organization (WTO), arguing that this unilateral rate-setting interferes with the rights of European SEP holders in their home jurisdictions.

Why SEP Litigation is Increasingly Global

SEP disputes frequently span multiple jurisdictions because patents are territorial rights while technology standards are global.

As a result, companies often pursue parallel litigation in several countries simultaneously to gain strategic leverage in licensing negotiations.

1 https://www.essentialpatentblog.com/wp-content/uploads/sites/64/2017/12/2015.07.10-284-Injunction-Enjoining-Worldwide-SEP-Suits.pdf.
2 https://indiankanoon.org/doc/159852349/.
3 https://supremecourt.uk/uploads/uksc_2018_0214_judgment_38ddfc700f.pdf.
4 Id at 48.

3. Strategic Perspectives in the SEP Ecosystem

These challenges are often viewed differently by SEP stakeholders:

Stakeholder	Strategic Priority	Key Concern
SEP Holders	Maximize returns on R&D investment	Prevent patent hold-out
Implementers	Access technology at sustainable royalty rates	Avoid patent hold-up
Regulators	Maintain fair competition	Prevent abuse of dominance
Standards Bodies	Promote interoperability	Maintain industry participation

4. Transparency and Disclosure

A fundamental challenge in the SEP ecosystem is the lack of transparency resulting from widespread over-declaration of patents.

- **Over-Declaration**: SEP holders declare significantly more patents as essential than are ultimately proven to be so, incentivized because licensing rates are often negotiated based on portfolio size.
- **System Clogging**: The sheer volume of non-essential, yet declared, patents clog the system, creating significant transaction costs, adding legal risk, and hindering the efficient adoption of standardized technologies.

5. Strategy and Best Practices for Stakeholders

I. Strategy for SEP Holders (Licensors)

The primary objective of SEP holders is to maximize the return on their R&D investment by efficiently monetizing their SEP portfolio while maintaining compliance with FRAND obligations.

Effective Portfolio Management, Enforcement, and Proactive Campaigns:

- **Focus on Quality Over Quantity**: Instead of declaring every possible patent, SEP holders should rigorously assess their portfolio to focus on patents that are truly essential (must be used to implement the standard) and valid (can withstand legal challenge). A smaller portfolio of strong SEPs commands higher respect and is easier to defend than a massive thicket of weak patents.
- **Establish a Clear, Globally Consistent FRAND Licensing Policy**: Develop a standardized, transparent policy that applies the same core methodology (e.g., using the smallest saleable patent practicing unit or a top-down approach) worldwide. Consistency across offers is crucial to demonstrating the Non-Discriminatory limb of FRAND and defending against antitrust claims.
- **Enforcement Strategy**: Be prepared to use the threat of an injunction strategically. Courts often grant injunctions against companies classified as "unwilling licensees," making injunctions the most powerful tool to bring a licensee to the negotiating table.

II. Strategy for Implementers (Licensees)

The implementers seek access to standardized technology at licensing rates that remain commercially viable.

Defensive Measures, SSO Participation, and Challenging Essentiality/Validity:

- **Proactively Engage in Licensing Negotiations in Good Faith**: This is the most critical strategy. By engaging sincerely and making a reasoned counteroffer (backed by evidence), the implementer establishes itself as a "willing licensee." This status is key, as courts are highly reluctant to grant injunctions against a willing licensee (e.g., the *Huawei v. ZTE*[5] precedent). Failure to engage in good faith is viewed as "patent hold-out."
- **Strategic Use of Validity and Essentiality Challenges**: Implementers should actively challenge the validity (e.g., lack of novelty) or essentiality (e.g., the patent isn't truly required by the standard) of weak patents. Successfully challenging even a few core SEPs can significantly reduce the aggregate royalty rate for the entire standard.
- **SSO Participation**: Actively join the SSO to influence the development of future standards and to monitor competitors' SEP declarations.

III. Role of SSOs in Mitigating Disputes

SSOs, like ETSI or IEEE, create the standards but generally do not enforce FRAND terms. However, they play a vital role in preventing disputes through policy design.

Enhancing IPR Policies and Dispute Resolution Mechanisms:

- **Potential for Stronger IPR Policies**: SSOs could require more rigorous evidence of essentiality upon declaration. Currently, many patents are "over-declared." Requiring initial third-party technical verification would make the pool of SEPs more reliable and reduce the scope for disputes.
- **Implementing Pre-Screening Mechanisms or Technical Evaluation Bodies**: SSOs could establish an independent, neutral body to perform cheap, quick, non-binding technical evaluations of essentiality for parties. This provides a baseline understanding, removing low-quality patents from the negotiation, and focusing disputes on the financial terms.

IV. Policy and Regulatory Interventions

Governmental and regulatory bodies often intervene to correct market imbalances and provide legal clarity where the courts and SSOs have left gaps.

Analyzing Proposals for FRAND Specific Legislation:

- **The EU's Proposed SEP Regulation**: The European Commission has proposed a new regulation aimed at increasing transparency and efficiency. Key elements include establishing a SEP Registry managed by the EU Intellectual Property Office (EUIPO) and introducing a mandatory, non-binding conciliation process before litigation to help parties agree on a FRAND rate. This represents a significant move toward regulatory intervention to define FRAND compliance centrally[6].

5 Id at 45.

6 https://single-market-economy.ec.europa.eu/publications/com2023232-proposal-regulation-standard-essential-patents_en.

- **Competition Authorities**: Agencies like the U.S. Federal Trade Commission (FTC) and the European Commission's Directorate-General for Competition (DG COMP) play a critical role in policing anti-competitive behavior. They step in when a SEP holder uses the threat of an injunction to extract supra-FRAND royalties ("hold-up") or when an implementer uses delaying tactics to avoid paying ("hold-out").

V. Alternative Dispute Resolution (ADR)

ADR mechanisms offer a way to resolve complex, multi-jurisdictional SEP disputes outside of lengthy, costly court battles.

Mediation and Arbitration as Viable Alternatives to Litigation:

- **Promoting Binding Arbitration or Mediation**: Arbitration offers a confidential, faster, and often cheaper route. The parties can choose an expert arbitrator with deep technical and legal knowledge, which many general courts lack.
- **WIPO's Role**: Organizations like the World Intellectual Property Organization (WIPO) offer tailored mediation and arbitration services specifically designed for FRAND disputes. This approach allows a single neutral forum to determine a global FRAND rate without triggering the jurisdictional conflicts (ASIs/AASIs) seen in national courts. The final arbitral award, unlike a court decision, is enforceable under international treaties like the New York Convention across many countries.

Conclusion and Future Outlook on SEPs and FRAND

As global connectivity expands into new industries, the governance of Standard Essential Patents will increasingly shape the future of innovation, competition, and technological collaboration.

1. Summary of Key Findings: Balancing Innovation and Adoption

The central challenge of the SEP ecosystem remains fundamentally economic: balancing the reward for SEP innovation with the requirement of universal adoption. While patent law grants exclusivity, the FRAND commitment moderates this right, ensuring fair compensation without market exclusion. The current legal status is defined by jurisdictional complexity, with global courts employing various economic models to calculate FRAND rates amid constant debate over essentiality and the appropriate licensing base (component vs. end-product).

2. Implications for Innovation and Competition

The current framework's ambiguity carries significant negative implications, particularly for emerging sectors like IoT and connected Automotive.

- **Royalty Stacking**: Cumulative, high royalty demands from multiple SEPs create a severe financial burden, making the aggregate cost disproportionate to the product's profit margin.
- **Chilling Effect**: This financial uncertainty and the risk of facing a global injunction deter smaller **Implementers (SMEs)** from entering standard-compliant markets, stifling competition and concentrating market power among large incumbents.

3. Emerging SEP policies: Jurisdictional Divergence and Regulatory Trends

SEP policies are increasingly being used by jurisdictions to balance intellectual property protection with economic goals, leading to a divergence in regulatory and judicial approaches globally. These policies provide strategic guidance on pre-litigation conduct, define parameters for FRAND terms, and influence the choice of forum and remedy.

Jurisdiction	Policy/Authority	Key Policy/Trend	Impact & Focus
European Union (EU)	Proposed SEP Regulation[1] (Drafted by the European Commission)	Mandatory, non-binding FRAND Conciliation and Essentiality Checks by the EUIPO (new SEP Competence Centre).	Shifts dispute resolution toward a centralized administrative process, enhancing transparency of essentiality and aggregate royalty burden before litigation.
China	China's State Administration for Market Regulation (SAMR) SEP Guidelines (2024)[2]	Introduces SEP-specific provisions into the Anti-Monopoly Law (AML), emphasizing disclosure obligations and the "three letters and one notice" system for antitrust intervention.	Strong antitrust scrutiny on SEP holders. Aims to balance innovation incentives with protecting domestic implementers from monopolistic licensing practices. China is a prominent court for global rate-setting.
United Kingdom (UK)	Judicial Precedent (Unwired Planet, InterDigital v Lenovo, Optis v Apple)[3]	Confirmed authority of UK courts to determine a global FRAND rate for an entire portfolio. The rate is largely based on comparable licenses.	Positioned as a major SEP enforcement forum. Ongoing consultation proposes a 'Rate Determination Track' (RDT) to further specialize FRAND calculation during litigation[4].
United States (US)	Shifting Administrative Guidance (USPTO/ DOJ/FTC)	Policy instability has created uncertainty on the availability of injunctions against implementers deemed willing to negotiate FRAND terms.	The uncertainty drives SEP holders to the US International Trade Commission (ITC), which remains a powerful forum for seeking exclusion orders (a form of injunction) against infringing products.
Japan[5]	Good Faith Negotiation Guidelines	Encourages detailed, 4-step negotiation process leading from an SEP holder's offer to the implementer's response, aimed at early dispute resolution.	Supports a private ordering approach by codifying expected behavioral conduct to reduce the need for litigation.

Global Context and Strategic Implications:

- **Trade Protectionism**: It is important to acknowledge that many contemporary SEP policies, particularly in the EU and China, are perceived to contain a trade protectionist sentiment. This is evidenced by efforts (such as the EU's proposed Regulation and China's anti-suit injunctions) to assert national jurisdiction or protect domestic industries from adverse decisions in foreign courts, sometimes raising questions about their compatibility with the TRIPS Agreement.
- **Harmonization Challenge**: The varying standards for FRAND determination (judicial discretion in the UK vs. administrative conciliation in the EU) and the differing thresholds for antitrust intervention (SAMR in *China vs. FTC* in the US) create a fragmented ecosystem. This necessitates that global companies must maintain jurisdiction-specific negotiation and litigation strategies.
- **India's Position**: Policy dialogue on SEPs is currently absent in India. Any future policy development should consider models from other nations, potentially adopting a competition law-led approach (like China) or a private ordering support structure (like Japan).

1 https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/754578/EPRS_BRI%282023%29754578_EN.pdf.
2 https://www.kwm.com/cn/en/insights/latest-thinking/samr-releases-antitrust-guidelines-for-seps.html.
3 https://www.wipo.int/wipolex/en/text/594688.
4 https://www.osborneclarke.com/insights/uk-government-launches-consultation-standard-essential-patents-support-tech-driven-growth.
5 https://www.meti.go.jp/policy/economy/chizai/sep_license/good-faith-negotiation-guidelines-for-SEPlicenses-en.pdf.

4. Future Trends and Recommendations

The Expanding Role of SEPs in Emerging Technologies

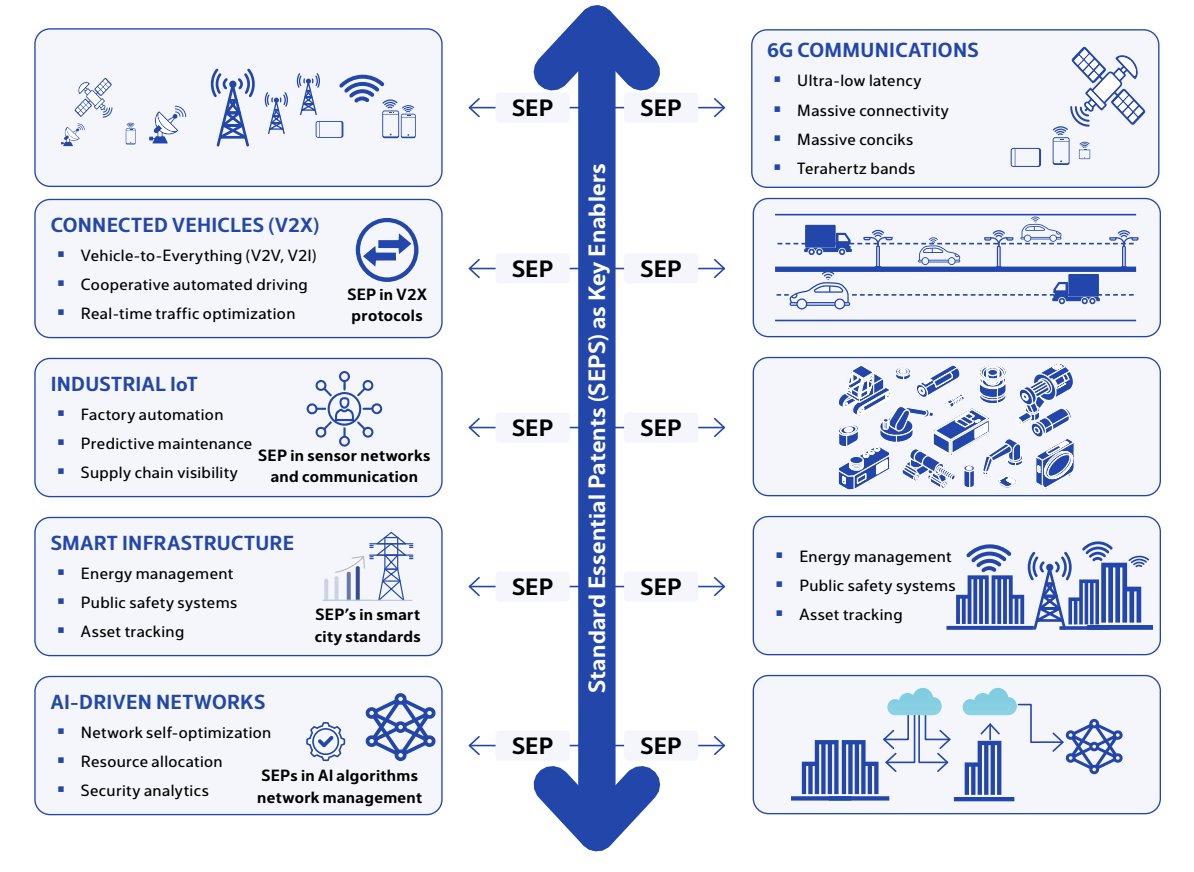


Figure 12: The Expanding Role of SEPs in Emerging Technologies

As emerging technologies such as 6G, connected vehicles, and industrial IoT continue to expand the scope of standardized innovation, the importance of effective SEP governance will only increase.

The future of the SEP ecosystem will depend on maintaining a careful balance between rewarding technological innovation and ensuring the widespread adoption of interoperable technologies across the global digital economy.

Achieving this balance will require continued collaboration among innovators, implementers, regulators, and standards bodies to ensure that the global standardization system remains both competitive and innovation-driven.

Strategic Pillars of the SEP Ecosystem

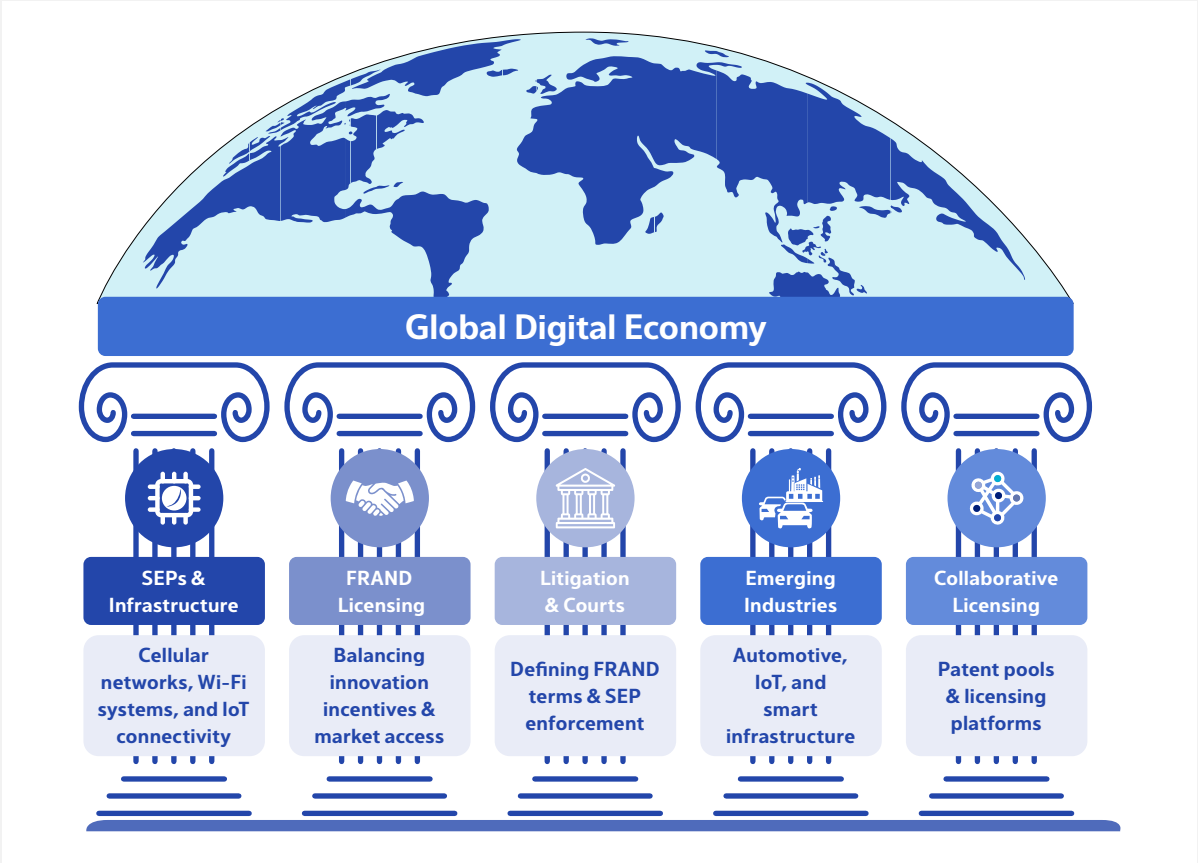


Figure 13: Strategic Pillars of the SEP ecosystem

Standard Essential Patents operate at the intersection of innovation, standardization, and global market adoption. The five pillars illustrated above summarize the key forces shaping the future of SEP ecosystem

About IPpro

IPpro is a specialized intellectual property consulting firm that helps organizations create, manage, and monetize patent portfolios. Our multidisciplinary team of patent agents, attorneys, engineers, and scientists combines legal, technical, and industry expertise to deliver strategic IP solutions across sectors including telecommunications, electronics, life sciences, and emerging technologies.

We support clients throughout the patent lifecycle, from patentability analysis and drafting to prosecution, portfolio strategy, licensing analysis, and enforcement support.

IPpro also advises clients on Standard Essential Patent (SEP) analytics, essentiality assessments, and licensing strategies for standards-driven technologies such as cellular communications, IoT, and connected devices.

Headquartered in Bangalore with offices in Silicon Valley and Mumbai, IPpro serves clients across global innovation ecosystems.

IPpro is an affiliated firm of Nishith Desai Associates.

About NDA

At Nishith Desai Associates, we have earned the reputation of being Asia's most Innovative Law Firm — and the go-to specialists for companies around the world, looking to conduct businesses in India and for Indian companies considering business expansion abroad. In fact, we have conceptualized and created a state-of-the-art Blue Sky Thinking and Research Campus, Imaginarium Aligunjan, an international institution dedicated to designing a premeditated future with an embedded strategic foresight capability.

We are a research and strategy driven international law firm with Indian offices in Mumbai, New Delhi, Bangalore and GIFT City and foreign offices in New York, Palo Alto (Silicon Valley) and Singapore. Our team comprises of specialists who provide strategic advice on legal, regulatory, and tax related matters in an integrated manner basis key insights carefully culled from the allied industries.

As an active participant in shaping India's regulatory environment, we at NDA, have the expertise and more importantly — the VISION — to navigate its complexities. Our ongoing endeavors in conducting and facilitating original research in emerging areas of law has helped us develop unparalleled proficiency to anticipate legal obstacles, mitigate potential risks and identify new opportunities for our clients on a global scale. Simply put, for conglomerates looking to conduct business in the subcontinent, NDA takes the uncertainty out of new frontiers.

As a firm of doyens, we pride ourselves in working with select clients within select verticals on complex matters. Our forte lies in providing innovative and strategic advice in futuristic areas of law such as those relating to Blockchain and virtual currencies, Internet of Things (IOT), Aviation, Artificial Intelligence, Privatization of Outer Space, Drones, Robotics, Virtual Reality, Ed-Tech, Med-Tech and Medical Devices and Nanotechnology with our key clientele comprising of marquee Fortune 500 corporations.

The firm has been consistently ranked as one of the Most Innovative Law Firms, across the globe. In fact, NDA has been the proud recipient of the Financial Times–RSG award 4 times in a row, (2014-2017) as the Most Innovative Indian Law Firm.

We are a trust based, non-hierarchical, democratic organization that leverages research and knowledge to deliver extraordinary value to our clients. Datum, our unique employer proposition has been developed into a global case study, aptly titled '**Management by Trust in a Democratic Enterprise**,' published by John Wiley & Sons, USA.

Management by Trust in a Democratic Enterprise: A Law Firm Shapes Organizational Behavior to Create Competitive Advantage

NISHITH DESAI

The founder of Mumbai-based Nishith Desai Associates (NDA) built his law firm on a few powerful ideas: a trust-based, nonhierarchical, democratically managed organization that leverages research and knowledge to deliver premium services, high value, and a unique employer proposition that shatters many negative law-firm stereotypes. The author discusses the rationale behind NDA's business model and its organization and talent framework, and tracks the firm's philosophical genesis, which includes ideas from Mahatma Gandhi on democracy and from Charles Handy on trust in virtual organizations. He examines the implications of Handy's Rules of Trust for HR policies and practices, and then he describes NDA's approaches for creating challenge, growth, and rewards in a nonhierarchical structure; building behavioral competencies; balancing control with freedom; and other management practices that empower employees to act in the best interests of the firm and its clients. © 2009 Wiley Periodicals, Inc.

Think of a profession that, by its very nature and craft, tends to ingrain such attitudes as low trust, skepticism, and dispassion; where the personal interest and goals of individualistic, ambitious, self-driven, ego-led professionals supersede any commitment to the organization's goals. Chances are that the legal profession will be at the top of your list. If not, just think of a lawyer—and the description fits effortlessly. (As a lawyer, I have no qualms making this statement.)

Now, add to that the long-held fundamentals of running a competitive law firm. Profitability is driven by leverage (number of people) and hourly rate realization, which effectively means profitability is increased by working people more hours or hiring more people. Thus, what you tend to find is a sweatshop of overworked professionals with no work-life balance, high attrition, burnout, and indifferent loyalty. That apart, hierarchy, leverage, seniority bias, formality, and conservatism largely dominate a law firm environment. And what's more, this tends to typify law firms anywhere in the world.

Consequently, dodging the traditional law-firm constraints to create a very different organizational model, employer proposition, and culture is a tall order. But in our experience, it is a tremendous opportunity for value creation. It drove us to think "out of the box" and establish afresh a compelling culture, organization, and people strategy that would ultimately attract and retain the talent that we wanted for a longer-term competitive advantage.

For the two decades since its establishment in 1989 in Mumbai, India, our firm, Nishith Desai Associates (NDA), has been conceptualizing, implementing, and refining our approach to and practice of managing a democratic, trust-led enterprise that delivers high-value, premium-positioned legal services. That our approach has made some headway is indicated by NDA's growth—about 100 members and additional offices in India (Bangalore), the United States (Palo Alto, California), and Singapore—and

WILEY InterScience

© 2009 Nishith Desai Associates. Reprinted by permission of Nishith Desai Associates. All rights reserved.
Published online in Wiley InterScience (www.interscience.wiley.com)
Global Business and Organizational Excellence • DOI: 10.1002/joe.20284 • September/October 2009 7

Research@NDA

Research is the DNA of NDA. In early 1980s, our firm emerged from an extensive, and then pioneering, research by Nishith M. Desai on the taxation of cross-border transactions. The research book written by him provided the foundation for our international tax practice. Since then, we have relied upon research to be the cornerstone of our practice development. Today, research is fully ingrained in the firm's culture.

Over the years, we have produced some outstanding research papers, reports and articles. Almost on a daily basis, we analyze and offer our perspective on latest legal developments through our "Hotlines". These Hotlines provide immediate awareness and quick reference, and have been eagerly received. We also provide expanded commentary on issues through detailed articles for publication in newspapers and periodicals for dissemination to wider audience. Our NDA Labs dissect and analyze a published, distinctive legal transaction using multiple lenses and offer various perspectives, including some even overlooked by the executors of the transaction. We regularly write extensive research papers and disseminate them through our website. Our ThinkTank discourses on Taxation of eCommerce, Arbitration, and Direct Tax Code have been widely acknowledged.

As we continue to grow through our research-based approach, we now have established an exclusive four-acre, state-of-the-art research center, just a 45-minute ferry ride from Mumbai but in the middle of verdant hills of reclusive Alibaug-Raigadh district. Imaginarium AliGunjan is a platform for creative thinking; an apolitical ecosystem that connects multi-disciplinary threads of ideas, innovation and imagination. Designed to inspire 'blue sky' thinking, research, exploration and synthesis, reflections and communication, it aims to bring in wholeness — that leads to answers to the biggest challenges of our time and beyond. It seeks to be a bridge that connects the futuristic advancements of diverse disciplines. It offers a space, both virtually and literally, for integration and synthesis of knowhow and innovation from various streams and serves as a dais to internationally renowned professionals to share their expertise and experience with our associates and select clients.

We would love to hear from you about any suggestions you may have on our research publications.
Please feel free to contact us at **research@nishithdesai.com**.

Recent Research Papers

Extensive knowledge gained through our original research is a source of our expertise.

February 2026

AI & Deep Tech Investments Landscape

A report from India Deep Tech Alliance (IDTA)

January 2026

Research Paper Compendium

Clickable Catalogue of Publications

November 2025

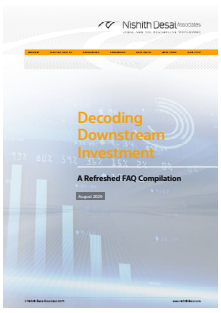
The Indian Semiconductor Ecosystem

Legal, Tax and Regulatory Pathways to Global Leadership

October 2025

Patent Blind Spots in India's Startup and MSME Landscape

Structural Barriers and Strategic Remedies



August 2025

Decoding Downstream Investment

A Refreshed FAQ Compilation

June 2025

Mergers & Acquisitions

An Indian Legal, Regulatory and Tax Perspective

For more research papers **click here**.

Nishith Desai Associates
LEGAL AND TAX COUNSELING WORLDWIDE

INDIA OFFICES

MUMBAI

93 B, Mittal Court, Nariman Point
Mumbai 400 021, India

Tel +91 22 6669 5000

MUMBAI BKC

3, North Avenue, Maker Maxity
Bandra–Kurla Complex
Mumbai 400 051, India

Tel +91 22 6159 5000

BENGALURU

Prestige Loka, G01, 7/1 Brunton Rd
Bengaluru 560 025, India

Tel +91 80 6693 5000O

NEW DELHI

13-H, Hansalaya Building, 15
Barakhamba Road, Connaught Place
New Delhi 110 001, India

Tel +91 11 4906 5000

GIFT CITY

408, 4th Floor, Pragya Towers
GIFT City, Gandhinagar
Gujarat 382 355, India

FOREIGN OFFICES

NEW YORK

1185 6th Avenue, Suite 326
New York, NY 10036, USA

Tel +1 212 464 7050

SILICON VALLEY

220 S California Ave., Suite 201
Palo Alto, California 94306, USA

Tel +1 650 325 7100

SINGAPORE

Level 24, CapitaGreen
138 Market St
Singapore 048 946

Tel +65 6550 9855

BOSTON

Cambridge Innovation Center,
1 Broadway, Cambridge,
MA 02139

Standard Essential Patents (SEPs)
Legal Frameworks, Licensing Challenges, and Strategy Implications

concierge@nishithdesai.com