

TECHNOLOGY WATCH REPORT



Solutions for smart mobility

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TECHNOLOGY WATCH REPORT

Solutions for smart mobility

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Overview of innovation and tendencies in Smart Mobility

The **changing preferences** of citizens and customers, combined with growth opportunities in the transport service industry, explain why vehicle manufacturers are shifting their focus from product-based solutions to **service-based solutions**.

Over the next few years, **Infotainment** (channels providing passengers with information and entertainment), **vehicle safety, tracking, and other security features** for cars, for example, will become high-value services available to certain segments of vehicle buyers, whereas in the field of public transport system driverless and ticketless **autonomous buses and trains** will become the norm. New mobility solutions, such as **connected vehicles**, fast shuttles and **shared mobility**, also provide new travel options potentially related to **saving money** and time, as well as improving the transport experience, thus satisfying **passenger needs**.

But **innovations in the field of smart mobility transcend the car industry** and spread into other areas.

“The tendency is for territories to begin preparing to identify the challenges and citizen transport needs to improve the mobility management and operation within the city and between cities.”

- On the one hand, it is necessary consider **infrastructural improvements** of highways and other roads, buildings, and parking areas. Optimising the use of parking spots in urban areas, **smart parking** or special lanes will also be slowly imposed in cities throughout the world.
- On the other hand, a recent report by Frost & Sullivan on the future of smart mobility helps understand the importance, in this field, of the weight of solutions related to **data management**. Not in vain, the **computer and telecommunications industry** is behind innovations related, among others, with wireless sensors, vehicle operating systems, integrated price management, real-time traffic management or the applications for planning mobility.
- Erupting even beyond the car industry, transport, infrastructures and telecommunications, an increasing number of innovations in smart mobility take place in **other areas**: energy, finances, insurance, retail sales, health, law and the media.
- **Innovations in the public sector** are also strongly influenced by new tendencies,

because the cities are users of innovative solutions for **urban operations and services** covered by social, economic and environmental aspects. “A **smart city** is an enabling platform built by the government, for the people, to understand and manage the interactions between people and the infrastructure in a city, and to guide informed policymakers through the intelligent usage of technology” (Frost & Sullivan, Future of Smart Mobility: Smart City, 2017).

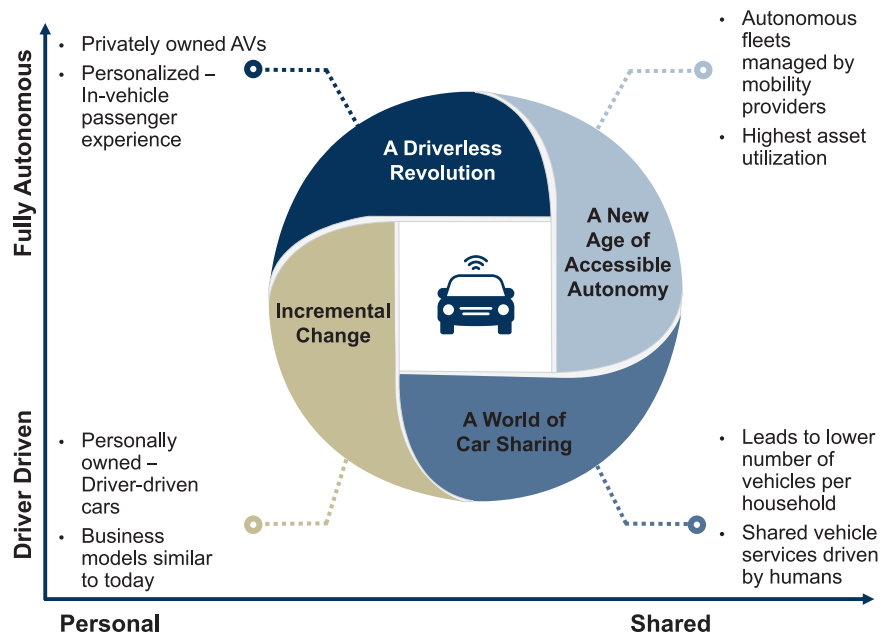
Nowadays, the focus of the majority of smart cities is limited to research and pilot initiatives because **governments still strive to adopt strategies, laws and policies** to spread them and make them a reality. But this scenario is expected to change drastically over the next 10 years. Different cities in the world require different mobility models, and so various stages of development coexist simultaneously.

Our analysis concludes that **the tendency is for territories to prepare** to identify mobility challenges and **citizen needs**, determine which **strategies and technological applications** show greatest potential to approach and mitigate challenges, examine technical mechanisms, legislative and institutional needs and, in short, improve mobility management and operations **in the city and between cities**, assuming better inclusion and coverage rates.

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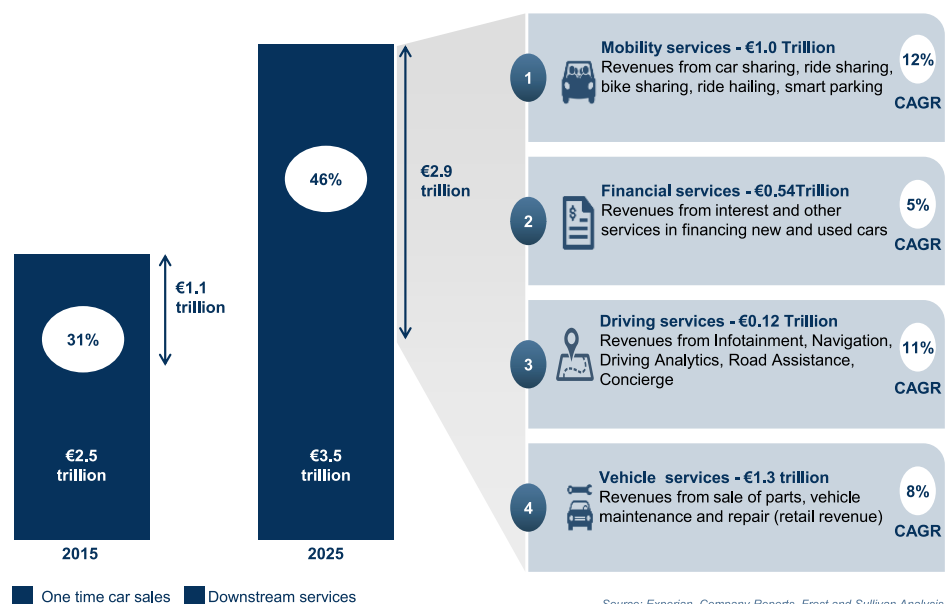
Solutions for smart mobility: Key infographics on a dynamic market

2.1. Emergence of four future states of mobility








Source: Frost & Sullivan (2017). Future of Smart Mobility - Key City Profiles, 2017.

2.2. New business models in vehicle mobility








Source: Frost & Sullivan (2017). Intelligent Mobility, 2017.

2.3. Car data monetisation

Data Type	Data Sources	Use Cases
 External Environment Conditions	<ul style="list-style-type: none"> • ESP Data • Front camera sensor • Rain sensor data • Wiper usage • Cloud data 	<ul style="list-style-type: none"> • Slippery road warning • Low visibility warning • Black Ice Warning
 Vehicle Health Status	<ul style="list-style-type: none"> • Oil temperature • Airbag deployment • Diagnostics trouble codes • Prognostic trouble codes (GM specific) 	<ul style="list-style-type: none"> • Prognostics • Recall management • Warranty optimization • Condition-based maintenance management
 Vehicle Usage per Trip	<ul style="list-style-type: none"> • Speed • Location • Average load weight • Braking, acceleration, etc. 	<ul style="list-style-type: none"> • PAYD Insurance • Usage-based road tax • Delivery to vehicle trunk
 Driver Preferences	<ul style="list-style-type: none"> • Interior memory settings • Radio stations preferred • App usage 	<ul style="list-style-type: none"> • Predictive vehicle settings • E-Commerce in the car • Targeted advertisements
 Contextual Connected Services	<ul style="list-style-type: none"> • Speed, Direction, Location • Hard braking • Lane closure detected by front camera • Hazard light usage 	<ul style="list-style-type: none"> • Traffic sign information • Hazardous condition detected by front camera • Predictive traffic with ETA • Predictive hazard warning • Predictive on street parking • Predictive fuel information

Source: Frost & Sullivan (2017). Intelligent Mobility, 2017.

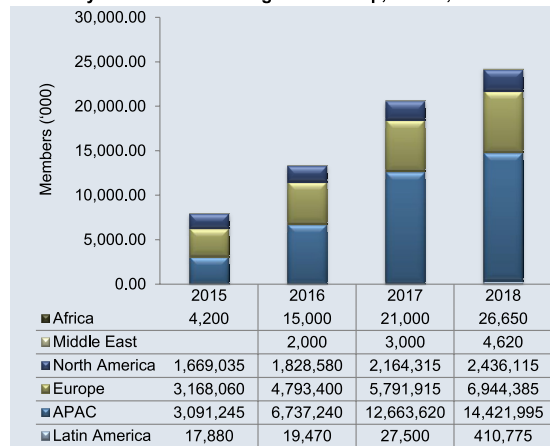
2.4. Emerging markets in the mobility industry

Carsharing	Ridesharing	eHailing	DRT	Integrated Mobility
 <ul style="list-style-type: none"> • Market consolidation, increased focus on technology partnerships, and diversification of business models from OEM-led carsharing programs • Greater push towards adoption of EVs and regulatory support from cities will drive growth of the carsharing market • Rising levels of competition, increasing investments, and growing demand from users globally for P2P carsharing • Integration of corporate carsharing operations with other mobility modes will increase potential for growth in the market 	 <ul style="list-style-type: none"> • Increasing competition for market share, strategic partnerships, and investments will drive market growth • Innovation in service offerings, corporate ridesharing programs, and ridesharing for short city commutes will allow for greater user adoption 	 <ul style="list-style-type: none"> • Greater support from governments, bundled services, and growing online population will allow for greater penetration of eHailing services into the traditional taxi market • City regulations and subsidies for electric taxis along with technology partnerships for autonomous driving will further boost market growth 	 <ul style="list-style-type: none"> • Transit agencies and authorities will play a vital role in restructuring the traditional bus transit model • Technologies such as big data analytics and development of algorithms for real-time and flexible operations will disrupt the current market 	 <ul style="list-style-type: none"> • Partnerships with public transit agencies, private mobility service providers, and technology companies to target public transit network • Greater synergies between private operators and OEMs will support expansion of operations

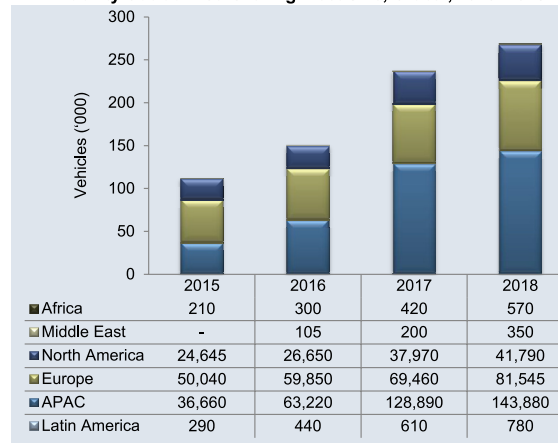
Source: Frost & Sullivan (2018). Global Mobility Industry Outlook, 2018.

2.5. Evolution of membership and global carsharing fleet size

Mobility Outlook: Carsharing Membership, Global, 2015–2018



Mobility Outlook: Carsharing Fleet Size, Global, 2015–2018



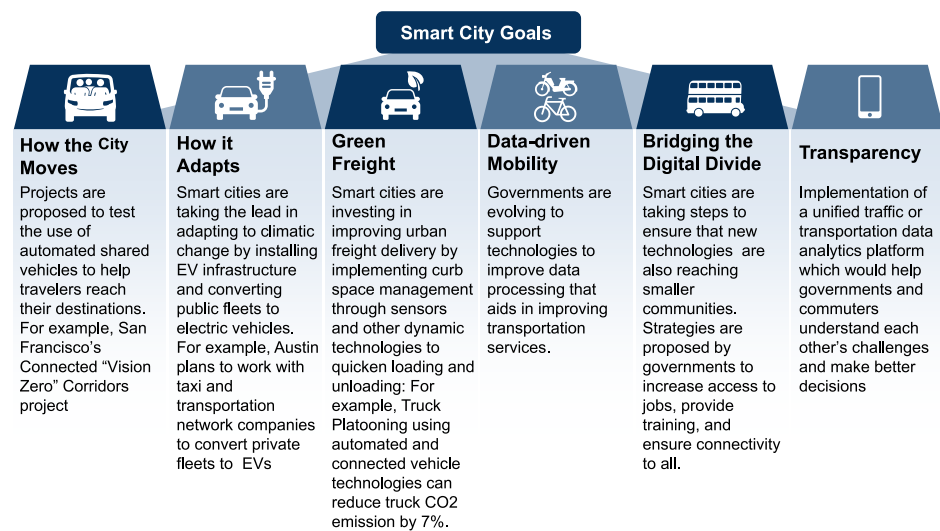
Source: Frost & Sullivan (2018). Global Mobility Industry Outlook, 2018.

2.6. The future of smart mobility: challenges of mobility



Source: Frost & Sullivan (2017). Future of Smart Mobility - Key City Profiles, 2017.

2.7. Strategic goals of a smart city



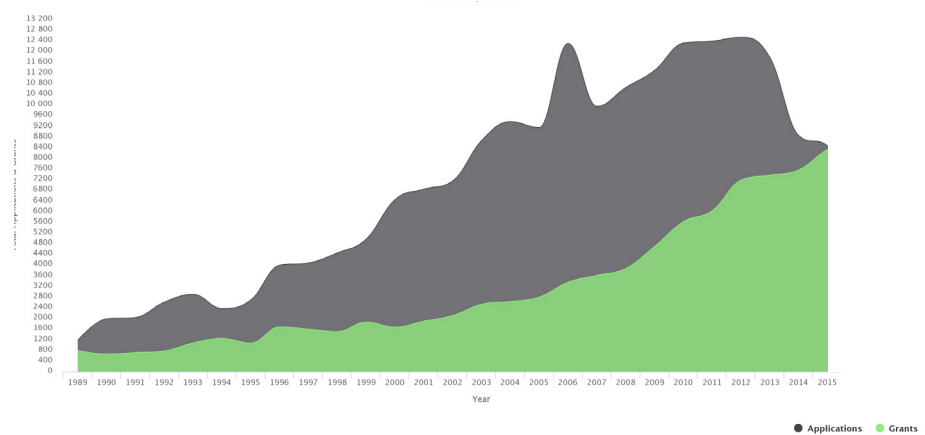
Source: Frost & Sullivan (2017). Future of Smart Mobility - Key City Profiles, 2017.

3

Patent analysis

3.1. Evolution of patents applied for and granted

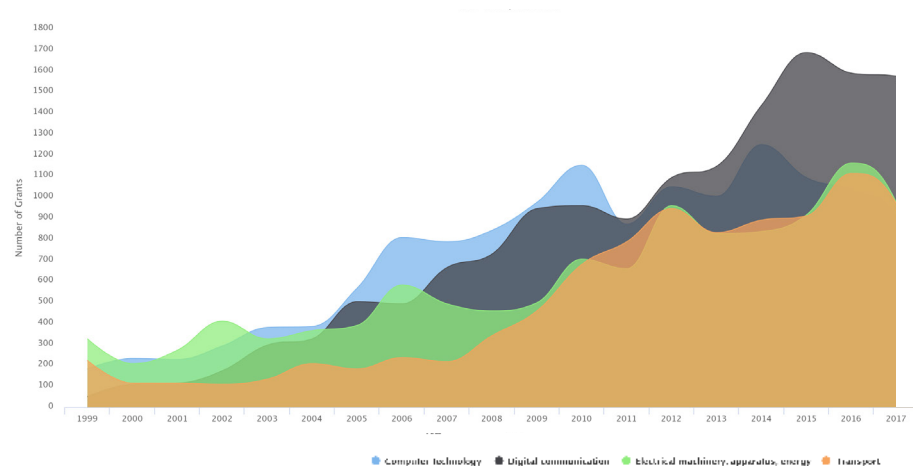
There is a clear upward tendency especially after 2000, when the patents granted leave behind a growing lineal tendency and take on a geometric progression, thus showing the interest and innovative character of this sector.



Source: PatBase. Query: April 2018.

3.2. Technological sector of the patents analysed

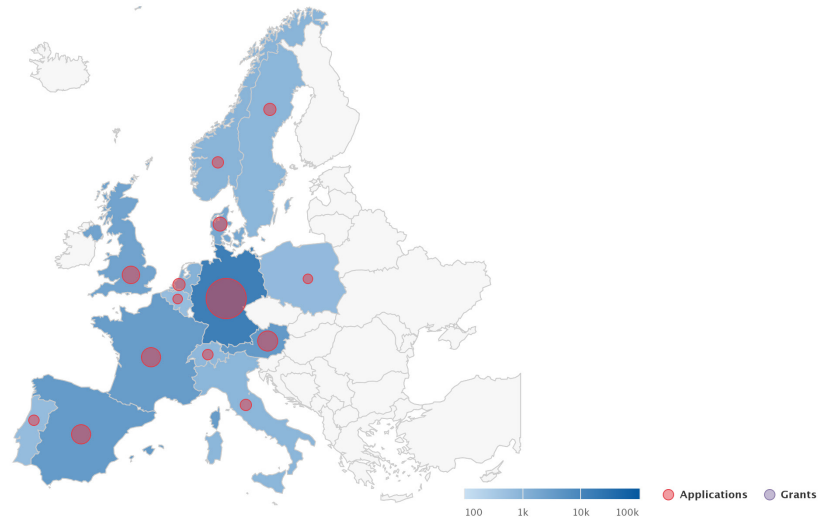
ICT is the basis for the technological development of the sector, revealing the practical adoption of the digital revolution, today known as the fourth industrial revolution or industry 4.0. The predominance of the field of digital communication over the last few years is, as could be expected, noteworthy.



Source: PatBase. Query: April 2018.

3.3. Localització territorial de patents: Europa a les top-30 jurisdiccions

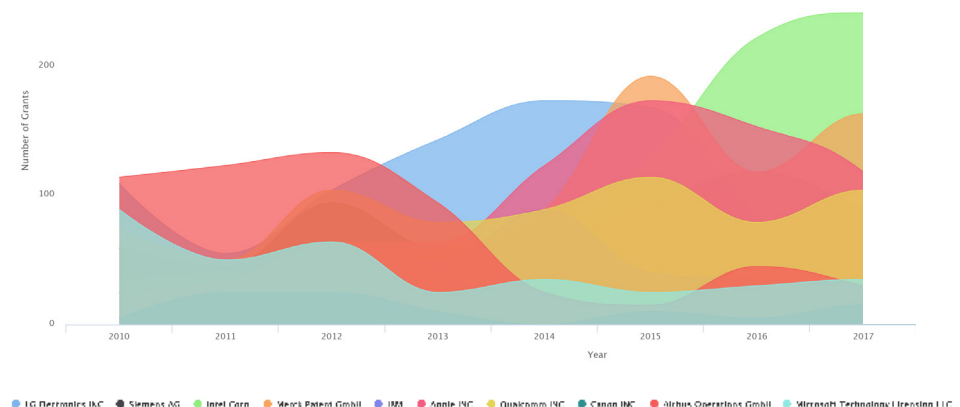
Analysis of the countries with most applications indicates where the sector analysed should be protected. Specific considerations of the various applications of technology are usually in addition to considerations related to the Gross National Product or the presence of clusters.



Source: PatBase. Query: April 2018.

3.4. Most active patent applicants over the last 20 years

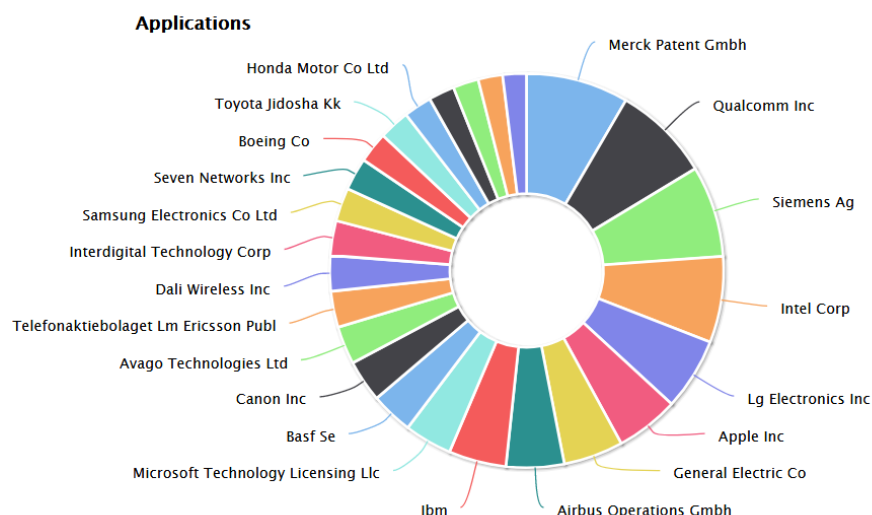
Taking the above graphs as a starting point, it is obvious and as expected, that leading edge companies in digital processing are those showing the greatest increase in patent applications for hardware and software, both technological facilitators.



Source: PatBase. Query: April 2018.

3.5. Who are among the most committed? Most active applicants over the last 10 years

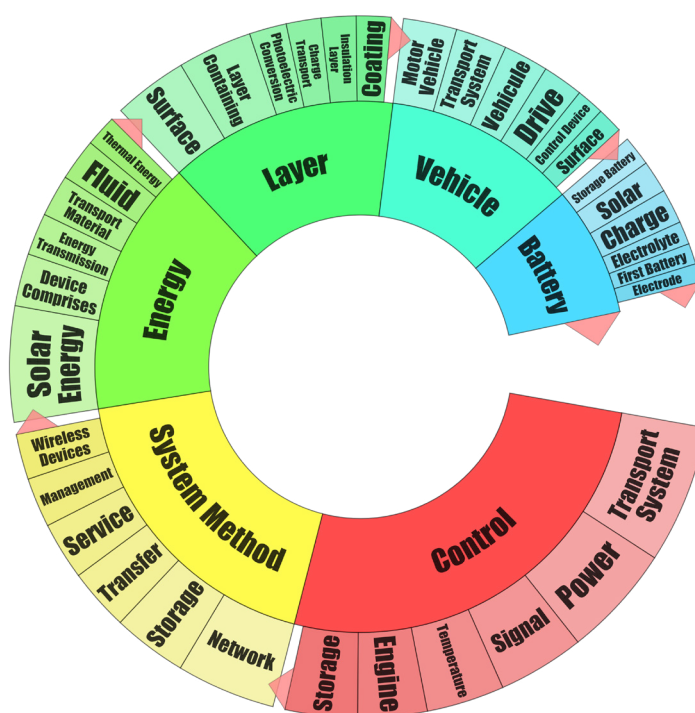
The confluence of basically two types of companies is obvious in the technological development of the sector: on the one hand, the transport and logistics companies, and on the other those developing hardware and software.



Source: PatBase. Query: April 2018.

3.6. Keywords attributed to patents in this field

Analysis of the most repetitive keywords in the patent sample, as well as the relationship between them, shows the hierarchy of thematic domains and applications that appear under the general concept of “smart mobility”.



Source: PatBase. Query: April 2018.

3.7. METHODOLOGICAL APPENDIX

The information provided in the “Patent analysis” section refers to a statistical study carried out on 224,971 patents applied for in the field of smart mobility over the last 30 years.

41,593	30,335	224,971	323,196
Patent family	Family of patents granted	Applications	Publications
Total number of families in this set of results	Total number of families with publications granted with this set of results	Applications with this result	Publications within this result

Source: PatBase. Query: April 2018.

Smart mobility is a generic concept with a strong multidisciplinary character involving many industrial sectors. This places extreme importance on the criteria used to determine the application sample to be analysed, requiring a careful selection of keywords, fields of knowledge and technological applications.

A breakdown of the various patent groups considered for obtaining the sample and belonging to two different classifications, is shown below: CPC (Cooperative Patent Classification) and IPC (International Patent Classification):

- B60G2800 / 98: intelligent transportation
- G05B2219 / 00: control sistema
- G06F3: data processing
- Y02D: climate change mitigation technologies in information and telecommunications technologies
- H04W12: security arrangements and authentication
- H04W4 / 02: services making use of location information

The sample was obtained by filtering on keywords such as ‘transport’, and using Boolean operands on the listed groups, to obtain a sample that is rich enough but with a veracity not clouded by any outliers that could misrepresent the conclusions stated in this report which are still open to interpretation by experts in this field.

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