



INRIX OpenCar:
*Connected and Integrated Services for a
Safe & Optimized Driving Experience*

A Frost & Sullivan White Paper

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Connected cars are often hailed as the biggest innovation that has happened to the 200 year old automotive industry. But is the connected car and customer experience woven around it creating a consistent revenue stream for the automaker or helping them sell more cars? The answer today is an emphatic no. Frost & Sullivan, an industry leader in the connected car space, developed this white paper to showcase how today's connected car solutions are fragmented and are not really making a difference to the automakers or consumers. This paper also showcases how an in-vehicle connected platform, like INRIX OpenCar, can enable a future that provides benefits across the associated ecosystem partners: drivers, automakers, and content providers.

PART I - CURRENT INDUSTRY POSTURE AND THE PROBLEM

Today about 10 percent of all cars and 25 percent of new cars are connected, and the percentage is even greater for luxury brands and models that provide a slew of connected features and services to customers. Increasingly, mass market vehicle manufacturers are shipping vehicles with embedded LTE connectivity. This includes almost 8 out of 10 brands ranging from GM to Fiat Chrysler to Subaru to Ford and others. Current connected programs are primarily providing mature telematics functionality pertaining to real-time traffic and breakdown assistance with some focus on nascent areas like prognostics using vehicle data.

Frost & Sullivan's recent consumer research indicates that over 60 percent of drivers globally still consider safety the most important attribute for vehicle purchase and place lesser emphasis on advanced technology features and services. However, customer awareness of the connected car is improving with close to 54 percent of those drivers surveyed indicating that they have heard the term 'connected car' though they may not understand the length and breadth of connected car capability.

Drivers are realizing that the in-vehicle features today don't really provide a seamless, safe and intuitive in-vehicle experience. This realization is pushing drivers to use in-vehicle technology less frequently and instead rely more on their smartphones for features such as navigation, media and so on. Research from AT&T recently revealed that 7 in 10 US customers are using their smartphone while driving, which leads to a safety compromised driving experience.

OEMs are trying to address the smartphone enabled distracted driving problem by creating driver monitoring systems, while also relying on federal and state agencies to create laws to prohibit smartphone use while driving. The reality is that the deficiencies in the current in-vehicle navigation and infotainment experience is the primary reason drivers default to their smartphone for information while driving. While luxury automakers like Jaguar Land Rover and Volvo are trying to address in-vehicle shortcomings by partnering with content integrators and creating a highly connected navigation and infotainment experience, many automakers are resorting to interfacing the smartphone in the car through technologies like Apple CarPlay and Google Android Auto. Further, business models around current in-vehicle navigation and infotainment systems are not netting any revenues for the vehicle manufacturers, not helping the automakers differentiate branding around the content experience, and most importantly not offering something that is safe and effective for drivers.

The Problem of Distracted Driving

In today's connected world, a large portion of the population is constantly interacting with connected devices, particularly mobile phones; and using a smartphone while behind the wheel is the very definition of distracted driving. The National Safety Council (NSC) reports that approximately 30 percent of all car crashes in 2012 were due to texting while driving, and this number has increased during each of the last three years. Research from AAA revealed that a teen driver is more prone to such accidents due to their technology savvy nature and lower attention span. The study also found that distracted driving was a factor in

nearly 6 out of 10 moderate-to-severe teen crashes. In examining rates of crashes stemming from distracted driving, the NSC along with other advocacy groups have devised the “Road to Zero” plan, a resolute plan to eradicate roadway fatalities within the next 30 years. Both the NSC and NHTSA are confident that a comprehensive approach, including contributions from other stakeholders, will move the industry towards the definitive goal of eliminating distraction-related crashes. As a start, fourteen states across the United States have banned the use of handheld devices while driving, with more expected to follow suit soon.



“While the public understands the risks associated with distracted driving, the data shows the behavior continues – we need better education, laws, and enforcement to make our roads safer for everyone,” said Deborah Hersman, President and CEO of the NSC.”

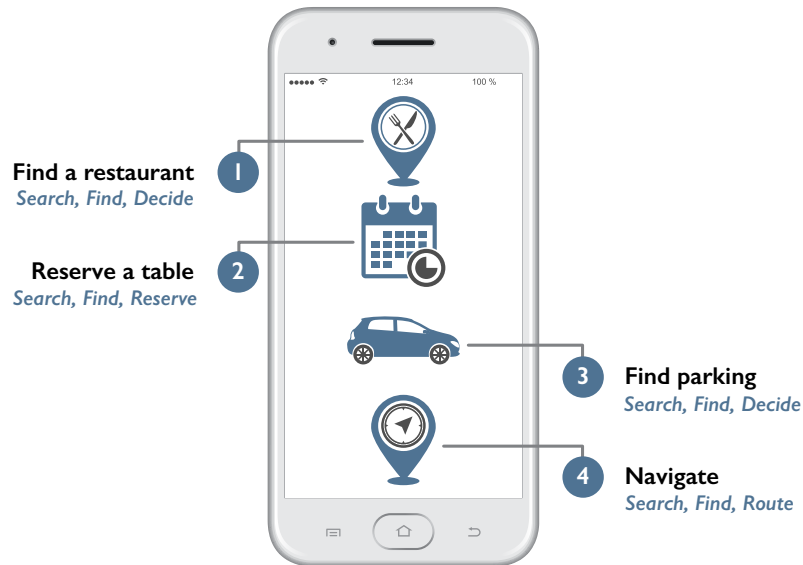
Not all the onus is on the driver; significant technology enhancements and driver optimized services have an equally important role to play in contributing to safer transportation – **“Hands on wheel, eyes on road.”**

Connected Experience Delivered Today is not Driving Optimized

Car connectivity is approaching ubiquity and enables a range of connected features and services to drivers. However, a serious concern with the current state of these solutions is the poor user experience (not optimized for driving) and lack of contextual content (accuracy to make informed decisions). For example, a typical journey may involve finding a location, getting directions, and identifying possible parking spots near the destination. Today’s in-vehicle technology is unable to perform these functions in succession; rather these actions would likely take at least three different apps or distinct steps that consume a significant amount of the driver’s time and attention. Such a situation limits the usefulness of the in-vehicle technology and puts driver’s safety at risk as they look for information while driving.

Interestingly, Frost & Sullivan’s consumer research revealed that majority of consumers globally were most willing to access in-vehicle apps instead of their phone if it augments their driving experience. The missing link is a driving optimized solution that is superior to the current alternative solutions.

TYPICAL MOBILE EXPERIENCE



PART 2 - PRESENT SCENARIO OF HYBRID INFOTAINMENT AND ITS LIMITATIONS

North America follows a clear trend of automakers offering extended free content trials with the motive to harness vehicle data to understand user preferences and build new content and experiences. In comparison to Europe and China, the United States leads the global market for telematics services with about 36 percent penetration under the subscription model offering services like safety, security, vehicle health and diagnostics. But is this combination of connected services translating into an experience that consumers are looking for? For example, when a driver wants to select his/her preferred playlist based on the route or travel time, there are several steps to navigate before the playlist is set up. In the current scenario, in-dash solutions do not showcase an integrated approach. The entire interaction model between technology and driver becomes a cumbersome and risky practice with limited optimized driving content.

In addition, automakers now have an option to interface the smartphone app experience in the car through Apple CarPlay and Google Android Auto. A recent driver satisfaction survey states that majority of the drivers today prefer CarPlay and Android Auto over an automakers in-dash platform. Though these solutions are currently favored by consumers over automaker home-grown in-dash offerings, due to their hands-free access to maps, phone, messaging, music, podcasts and third-party apps, the user experience is less refined when compared to an integrated approach. Siloed apps do not suffice the thirst of information requested by the driver, nor do they provide ease of access while the car is in motion. CarPlay and Android Auto merely mirror the phone on the dashboard and do not provide a holistic experience that the driver is expecting. As an alternative, Ford continues to develop SYNC AppLink framework and have even provided the framework, dubbed Smart Device Link (SDL), which is being considered by automakers like Toyota and Honda. SDL allows automakers to build their own app and content framework, but the challenges are many: scalability, creating effective branding, ability to monetize, negotiating content deals, and more.

Frost & Sullivan believes that solutions built by the automaker or by Apple or Google (phone mirrored on the dash) do not provide an integrated experience and aren't designed with safety as a top priority. These solutions face the same limitation as smartphones in the context of driving and squander the massive connected car opportunity for automakers.

Concept of Breadth of Tasks Completed vs Depth of Information Provided

Customers today are very aware of the concept of apps through their everyday life and are also increasingly aware of the growing presence of apps in the vehicle. Presently, individual apps provide what is called a “depth” experience – they are interactive and engaging, but do not showcase results across content providers. The missing link in creating a safe, integrated experience in the vehicle today is what is defined as “breadth” experience – presenting information that is personalized, integrated and relevant to the driver. A comprehensive and optimized driving experience requires technology that works across different content and blends information from different sources to present it to the driver in an integrated and easily digestible format.

A classic example of a point-of-interest (POI) search will highlight the differences between a “depth” and “breadth” experience. What will be the result in the present scenario while searching for a restaurant with reservation and parking? In a depth experience, like you would find using an app on your phone or using in-vehicle dash today, the driver would have to complete each task individually to find a restaurant of choice, for making a reservation, reserving parking and routing to the restaurant. Though individual apps will be able to present this information with “depth,” the entire sequence of completing these tasks individually makes the experience very siloed and unsatisfying. These tasks can be performed with ease and in succession on a smartphone with the luxury of a person’s full attention, but the vehicle environment requires a different approach. What kind of an experience will a “breadth” enabled framework provide in a similar situation? The answer to this is very simple; the “breadth” framework will present the content in an integrated format from many sources and display it in a standardized format to the user. For instance, this framework allows the user to search for his/her favorite cuisine with restaurant summaries and reviews, make a reservation, book a parking spot based on preferences and provide route guidance all as a single task. Frost & Sullivan believes that the future for such “breadth”-enhanced services is not far-fetched and an off-the-shelf seamless connected solution exists and provides significant advantages for the driver, the automaker and the app provider.

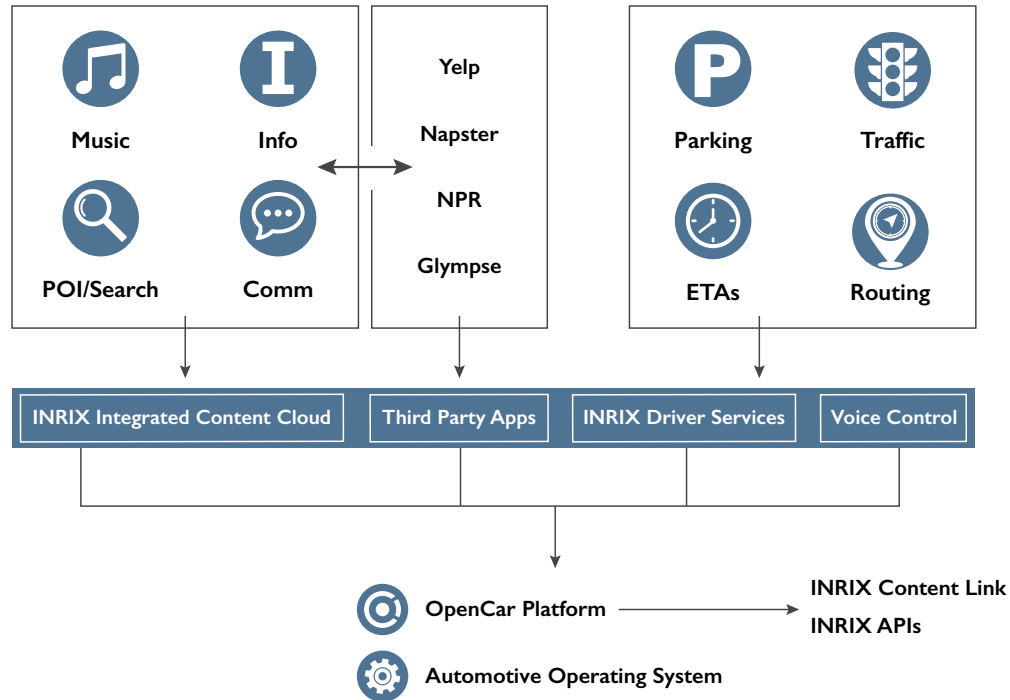
PART 3 - INTRODUCING INRIX OPENCAR – A DRIVING OPTIMIZED EXPERIENCE AND DIFFERENTIATED VALUE PROPOSITION

Concept of OpenCar

Early 2016 saw INRIX acquire OpenCar to bring an end-to-end connected car solution to market that addresses key pain points of both automakers and drivers. The ultimate goal is to offer automakers firm control of their driver- and vehicle-related data while providing a safe, driving-optimized experience with content that they are used to outside the vehicle. OpenCar works with the most up-to-date content and integrates it in a way that the driver has an enhanced and seamless experience within the vehicle. It provides the required breadth of infotainment elements plus INRIX driver and safety content such as Traffic, Parking, and Safety Alerts as an enhanced service that overcomes the associated safety risks of current solutions (today’s in-dash options or using the smartphone). Solutions such as Android Auto and CarPlay do not support an integrated approach, and there is a potential threat to automakers because of the way they control the ecosystem. The OpenCar solution addresses all these pain points and provides an ecosystem for partners to integrate and develop content without having to compromise on safety, privacy or driver experience.

Frost & Sullivan believes that OpenCar is the most sophisticated yet easy to use connected car solution.

THE INRIX CONNECTED CAR ECOSYSTEM



Benefits of OpenCar across the Ecosystem

User Experience: OpenCar presents information that is integrated and pertinent to the driver in contrast to the poor user experience that current solutions deliver.

- **New Content in the Car:** Enables consumers to access content and services that have been absent from the vehicles and delivers the connected experience they seek.
- **Integrated:** Negates the usage of a several of apps for a single task by integrating content from distinct sources and presents it in a normalized layout for the consumer.
- **Up-to-Date:** A cloud environment creates the ability for app developers and trusted app brands to deliver up-to-the-minute contextual content due to its standardized functionality. Such an approach aids consumers take informed decisions while driving and removes the associated risk of operating multiple apps.

Automakers: OpenCar addresses automakers key concerns by providing a suite of options with respect to their design and development cycles.

- **Data and Privacy Control:** Enables automakers to control data use and privacy which is not the case with current solutions such as Android Auto or CarPlay.
- **Brand Consistency:** Capability to adapt the in-vehicle look and feel, the cloud delivered content or both. The in-vehicle software framework blends with any automakers' exclusive UI requirements enabling them to maintain their uniqueness and brand consistency.

- **Configurability:** OpenCar configurability aids automakers to impeccably differentiate themselves across brands, models and regions on a single engineering effort.
- **Cost Effective to Provide New Content:** Automakers can employ OpenCar's cloud environment which crafts a foundation for app content developers to seamlessly build and deploy newer content. The hassle-free developer environment eliminates the need for automakers to negotiate with any third-party content provider to enable newer in-vehicle content, which is the case with current solutions.

OpenCar Meets Automakers Design Cycle Requirements

OpenCar can work in parallel with any automakers design cycle requirements. OpenCar is not only applicable to vehicles that are being designed for the future, but can be applied to vehicles currently rolling off the assembly line. OpenCar offers compelling value during each stage of an automaker's design cycle:

- **Future Vehicles and Models:** Automakers crafting a new model will look for a content provider who is able to create the "handshake" between the cloud content and in-vehicle software framework. The OpenCar in-vehicle software framework creates a seamless single-point in-vehicle content enabler for the automaker. In addition, the OpenCar in-vehicle software framework can coexist with solutions from Apple and Google, and run using the same in-vehicle software. The automaker would use both the OpenCar in-vehicle software framework and the OpenCar cloud-based content.
- **Design Complete, Production Ready Vehicle Models:** In the vehicle production stage where the in-vehicle software and hardware have been decided, automakers can add lighter-weight options of this framework to the in-dash stack to access both the cloud and integrated content. For example, the automaker would add a light-weight in-vehicle functionality layer on top of their existing in-dash stack and also access all the OpenCar cloud-based content plus in-vehicle content.
- **In Production Vehicle Models Can Add Additional Content:** Automakers can also choose to write their own in-vehicle software to get access to OpenCar cloud API's, allowing automakers to access the integration layer to receive content from multiple apps. The automaker is able to write software to connect their in-vehicle stack to all the OpenCar cloud-based content.
- **In Production Vehicle Models Can Add In-vehicle and Content Capability:** And finally, the OpenCar module is able to augment existing apps offered by the automaker and aid them in transitioning away from home-grown cloud infotainment content. Automakers would use the OpenCar in-vehicle software framework to connect to all the OpenCar cloud-based content as well as the automaker cloud content plus in-vehicle content.

“Automotive experiences are about consumption of the content, not managing the content”

The OpenCar In-vehicle Software Framework

The OpenCar in-vehicle software framework is one component in the INRIX connected car solutions suite, connecting to both in-vehicle content and driving-optimized content that resides in the cloud. The OpenCar in-vehicle software framework seamlessly integrates with any infotainment operating system and will aid automakers to either use the in-vehicle software framework as a standalone or with another supplier's in-vehicle platform

(such as CarPlay and Android Auto). The OpenCar in-vehicle software framework connects to INRIX Integrated Context Cloud, third party apps, INRIX driver services, and voice-enabled technology. Customization capability enables automakers to create a unique customer driving experience that is consistent with the automaker’s brand.

OpenCar InsideTrack – A Program and Project Management Tool for Automotive App Development

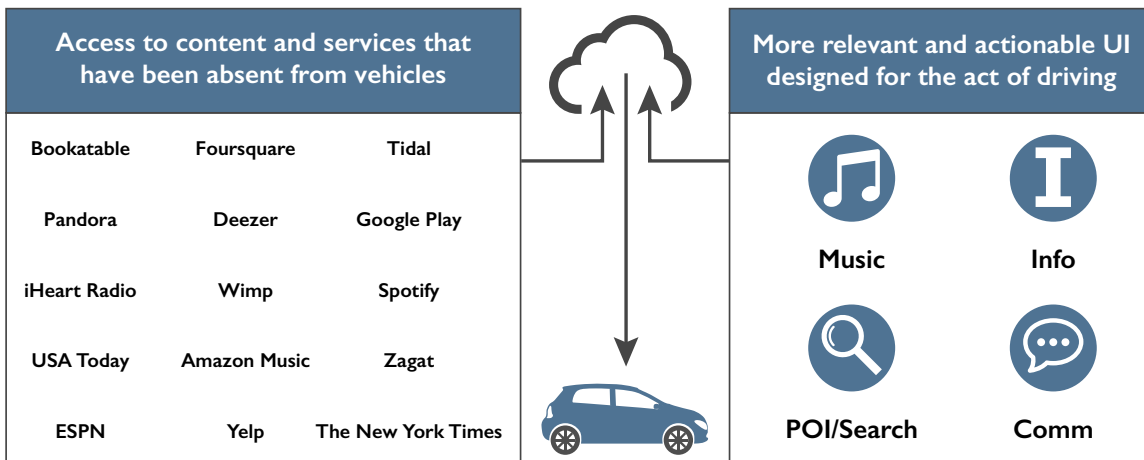
Customer expectations have placed tremendous pressure on automakers to change the way they strategize and manage their organizations. At the same time, the auto industry must be more imaginative to capture a larger share of consumer attention. OpenCar aids automakers in achieving this with InsideTrack, a collaborative portal that provides a managed systems development life cycle platform for developers to build in-vehicle apps. The portal currently supports more than 1,300 registered developers and provides a common tool set that not only enables developers, but aids automakers and Tier 1 suppliers in managing workflow quality.

OpenCar InsideTrack, apart from creating a collaborative environment, also ensures API compliance and validation cycles of the app development process. The portal sets a benchmark for the developer community, where code developed can be released across automakers. In addition, the portal fosters vehicle-specific program management and application management. Automakers can preserve the entire in-vehicle app lifecycle without the developers having to know the target vehicle for which the native apps that are being developed. It also provides the workflow for app certification while providing analytics on app usage and driver behavior to developers and automakers.

The OpenCar Cloud Content and Integrated Services

The integration layer in the cloud accomplishes what current solutions do not offer and what current drivers demand. The cloud integration layer aggregates the most relevant third-party content based on the driver’s request. Apart from an integrated approach, the platform also supports a simple app experience when just one app satisfies the driver’s need. In combination with driver services, the user experience is voice enabled by Amazon Alexa’s conversational technology, wherein drivers can speak their instructions rather than using the dashboard buttons. Frost & Sullivan believes that drivers can finally relate to an in-vehicle experience that is contextual and predictive with reduced distractions.

INRIX INTEGRATED CONTENT CLOUD



“Integrated services are focused on aggregation & easy search for breadth experiences, app vertical experiences are for depth”

OpenCar App Ecosystem - 63 Premium Content Providers and Growing

INRIX OpenCar’s ground up approach supports an app creation framework that aids developers in creating in-vehicle applications within days/weeks; thus, radically reducing time to market and downtime. Currently, OpenCar supports several branded apps such as NPR, Yelp, Stitcher, Napster, and Glympse, along with 63 premium apps in the development pipeline across multiple content categories.

The integrated content approach is best understood through an example. Let’s assume a driver searches for music. The OpenCar platform displays the “Integrated Music Setup Screen” where the user chooses his/her preferred music services from a set of on-demand or artist-radio choices. While requesting an artist of preference, the solution brings in its integrated or “smart” aggregation methodology by highlighting several songs by that artist from disparate sources. The songs presented can also be set up as a playlist based on the order of preferences, eliminating the need to navigate through multiple screens. This entire driver-centric interaction is voice enabled to further enhance accessibility and safety while driving.

Key Differentiators of the INRIX OpenCar Solution vs Current Market Solutions

Frost & Sullivan’s recent research indicates that most automakers desire a platform that empowers them to control the ecosystem and data privacy while enabling multiple app developers to contribute directly to the platform. OpenCar, a fully-embedded solution that can operate in an embedded or tethered environment, was built to enable this view point. In comparison to solutions such as Android Auto and CarPlay, there are more than a few highlights that showcase the distinct edge that OpenCar offers:

- Direct control over app publishing and distribution, including potential revenue from sales and subscriptions
- Support for automakers’ custom applications
- Assist automakers in keeping control of vehicle and driver data
- Direct integration with native experiences (e.g., navigation) without the driver having to switch to an isolated application
- Access to higher number of apps for content integration

In addition to the aforementioned, there is one essential differentiator that OpenCar offers automakers – adapting to human machine interface (HMI) and user interface (UI) systems offered across models and regions. Automakers using OpenCar’s in-vehicle Profile Development Kit can set rules that define each of their models’ HMI profile. Furthermore, OpenCar’s SDK facilitates a relevant environment for developers (automotive grade-APIs, simulators, and testing tools) to create portable applications that can blend with any automakers’ unique UI requirements.

PART 4 – THE FUTURE

INRIX OpenCar – Content Rich Driving Experience Allowing Automakers to Create Effective Branding and Monetization Opportunities

Smartphone replication solutions such as Android Auto and CarPlay are imperfect answers to an in-vehicle infotainment opportunity that is not being fully realized by automakers. The INRIX OpenCar solution provides an experience that works for all stakeholders. OpenCar is an opportunity for automakers to create a revenue stream from content and use content delivery to differentiate their models in a highly competitive marketplace. The platform is aimed at providing all ecosystem partners (automakers and content providers) an opportunity to develop and integrate content without having to compromise safety, privacy and consumer experience.

The concept of putting a smartphone in the dashboard for content integration is a model with severe limitations and drawbacks. The unique selling point of INRIX OpenCar is its ability to deliver a driver-optimized content experience tuned to the vehicle environment by integrating content and information from number of individual sources. Integrated content experiences not only enhance in-vehicle task completion in an intuitive and connected way but also reduce the safety risks associated with distracted driving, neither of which are being addressed by current solutions.


OpenCar is expected to be a boon for content developers due to the several customization options and the seamless framework/tools/simulator environment it sets up reducing application development, deployment and downtime. The OpenCar in-vehicle software framework not only controls the app publishing and distribution channel, but also maintains API compliance and validation cycles where automakers can preserve the entire in-vehicle app lifecycle across models worldwide.


In today's automotive world, vehicle data has large commercial value because of multiple revenue opportunities stemming from the cloud and related big data technologies. Automakers, with the help of technology suppliers, are focused on gathering specific data to creating actionable insights. There is a significant opportunity with respect to product planning, maintenance revenue and other related elements, which automakers have historically missed out on due to the lack of customer/vehicle data feedback.

INRIX OpenCar does not follow the route of the current solution providers, but rather enables automakers to control the UI, app delivery, and data use and privacy. A first step is to achieve incremental revenues per vehicle for the automakers; OpenCar can ably aid this realization as it integrates connected services, speech assistants, UI customization and cloud services, all under a single umbrella. Automakers currently rely on multiple third-party content providers and cloud service companies to aggregate contextually relevant and predictive content. By adopting an integrated solution like INRIX OpenCar, automakers can create additional revenue opportunities using a single source of data extraction, analytics and value-added services.


With clear advantages around time-to-market, lifecycle app and content management, branding, and revenue opportunities, Frost & Sullivan believes that it is time for automakers to start embracing the INRIX OpenCar solution as a clear choice for integrated content delivery to clearly differentiate themselves in the crowded connected car marketplace.

NEXT STEPS 

 **Schedule a meeting with our global team** to experience our thought leadership and to integrate your ideas, opportunities and challenges into the discussion.

Interested in learning more about the topics covered in this white paper?
 Call us at 877.GoFrost and reference the paper you're interested in. We'll have an analyst get in touch with you.

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