Decentralized Identity Foundation

Hospitality & Travel Special Interest Group

Use Case Developed by Verifiable Credentials & Offers Team

FINAL – 8 July 2021

1. **Use case name:** This Is Me and I Am Entitled to a Discount

2. **Short Description:**

Bob has several attributes and affiliations that entitle him to special rates at hotels. He wants to shop for hotels efficiently.

3. **Base Use Case:** None.

4. **Plain Language Description:**

Two to three paragraphs describing a real-life sequence of events that occur in the use case. Use real-sounding names appropriate for people, places, companies, and other named things. Describe the state changes and outcome for each actor. Give a clear description of each actor, such as "Alice, a corporate travel manager for IBM," or "Jim, a traveler who recently bought a Tesla."

Make the chronological order clear, using language to indicate any preconditions, the sequence in which the events occur, and the ending state.

If this is a variation of another (base) use case, state only how the use case differs from the base use case.

Bob is an employee of Acme Manufacturing (a small business). He is a member of the AAA auto club, holds a Citibank World MasterCard, is 63 years old, and lives in Boston. Bob is planning a business trip to Atlanta (traveling alone) and needs a hotel. He recalls that there are discounts available at various hotels through his employer, for his AAA membership, for his credit card, and possibly a senior discount. He wants to get the best deal available (potentially including price, inclusions, upgrades, etc.). He is willing to share the information about his affiliations with the hotels he is shopping in the hope of getting the best discount. He uses his travel app to specify that he is traveling to Atlanta on June 15 for 2 nights, needs a hotel near Buckhead, and wants a hotel with a gym. The app selects a list of qualified hotels and booking methods it and/or Bob chooses, and sends them the necessary identity details to get quotes, applying any available discounts for which he qualifies. Six hotels respond with offers. Bob chooses one and books it.

5. **Relevance:**

Why is this a relevant use case for SSI? What aspects cannot be, or have not effectively been, addressed by existing (non-SSI) processes and systems, or can only be addressed suboptimally (such as only by sharing more information than is really needed)?

Hospitality and travel have very limited (possibly no) capability today to create offers dynamically for a market-of-one against the specific combination of ID and credentials on offer by Bob during this one shopping call (booking search). The combination of credentials offered by Bob might also change frequently, which for the centrally organized customer information systems that all hotel companies operate today, poses some significant problems:

a. Travel suppliers such as hotels have no broadly adopted, standardized way (schema and API) to describe the products that they sell across hotel inventory and channel distribution systems except for a bedroom and associated room type that is a de facto standard. Additional information, such as whether the hotel has a parking lot or a gym, attributes of the core hotel product that might influence a booking, are even less standardized. Where attributes are exposed, they are often presented as filters to be applied after the shopping call has completed. Hotel companies that do provide mechanisms to include attributes in a booking query, often limit this capability to own-brand websites and mobile apps limiting the ability of 3rd party shopping tools to access this information. OTA's attempt to fill this gap, but then also mask the identity of the shopper, passing through to the hotel only non-identified customer information.

b. The base customer information that the hotel company holds for Bob needs to be accurate enough that the hotel website/mobile app can recognize Bob in real time during the shopping event, preferably without requiring that Bob first authenticate with the hotel company's systems.

c. It is unlikely that Bob is a member of each hotel company's customer loyalty program (if the hotel even has one). If Bob is not a loyalty member, he has no means of authentication to identify him early enough in the sales funnel for a relevant offer to be made. Bob's shopping call will therefore most likely to be processed as having been received from an anonymous shopper. Note that some CDP's do provide tools that attempt to close this gap and try to identify anonymous shoppers, but even the best of them can only calculate *the possibility* that Bob is a known shopper, and this requires base customer information to be very accurate, which for the most part in Hospitality, it is not (see b).

d. The hotel loyalty programs that Bob is required to be a member of will need to accommodate and action in real time any 3rd party affiliations. Most (possibly nearly all), either do not store the required affiliations, or are semi-connected systems that cannot action them.

e. Even if Bob is a member of a hotel loyalty program, if Bob is shopping via an OTA, it is not possible today on any known OTA site for Bob to submit the ID and credentials specific to each target hotel that are to be used in the shopping call. For a discount to be applied to the booking, the OTA would require Bob to use an OTA-provided identity, and receive only those benefits applicable to this ID.

f. Any affiliate information shared and stored with hotel systems will be required in full detail – specific affiliate membership numbers, credit card details, date-of-birth etc., most of which is unnecessary to complete the transaction, but without a better method, is the only means by which a hotel can determine whether the specific affiliations that Bob claims to hold are valid.

6. Assumptions:

List any key assumptions that must be true in order for the use case to be operative. If none, indicate None. Note that for some use cases, it may be difficult to distinguish assumptions (typically items outside the control of this effort) from dependencies (things within its control that are prerequisites); in this case simply combine the two and note in 7 "same as 6".

"Adoption advocacy," or the assumption that there is adequate communication and advocacy to spur initial adoption, is an assumption for most use cases and need not be identified separately.

- Bob uses an app that supports SSI.
- Bob's employer and AAA can issue verifiable credentials (via DIDs or some other mechanism acceptable to the supplier)
- Some trusted authority, such as a driver's license bureau, can issue verifiable credentials attesting that Bob's age meets the requirements for various senior rates offered by hotels.
- All relevant suppliers have the ability to receive shopping requests from Bob's app.
- There are no state/federal regulations preventing this (i.e. advertised vs. actual offers etc.)
- App (possibly in concert with a background agent that has access to Bob's Identity Hub) must support at least one persona per identity and their respective data and in real time analyze the offers based on multiple dimensions and requirements, honoring any time limits, availability requirements or other conditions stated for each offer. Support for multiple personas is preferred, e.g. business vs. leisure, hotel vs. rental car, etc.
- The user profile and persona must have been created in advance
- Verifiable credentials for affiliations have been issued to the user in advance of the shopping query
- The app and suppliers (or intermediaries representing them) are conducting real-time, peer-to-peer communications so that offers can be compared by Bob or his app immediately.
- If any hotel wants to ensure that the employment is current, then the employer provides a verification service.
- If any hotel wants to ensure that the AAA membership is current, then AAA issues verifiable credentials with an expiration date.
- Each hotel has a DIF identity hub in which it can store offers and share them with requesting parties, with offer terms interoperable across different DLTs.

7. Dependencies:

List any key dependencies that must be met in order for the use case to be operative. If none, indicate none.

- SSI adoption by at least one customer and one supplier
- Personalized Request capability by customer's user agent
- "Individual Offer" capability by supplier with offers stored in supplier's identity hub for future use, or using standardized APIs for immediate use; offer(s) may consider any or all of Bob's credentials

8. Industry and Consumer Benefit:

Explain how addressing the use case via SSI solves an industry and/or consumer problem, and key ramifications of doing so. How big/pervasive is the problem? Who does it affect? What (qualitatively or quantitative) would be the impact of solving it?

Consider citing the minimization of shared information as a benefit, reducing the question to "what information needs to be shared to answer the true question," for example "are you of legal age to buy alcohol" vs. asking to see an ID that has lots of other personal information.

How much does the supplier know about the customer, assuming the customer wants to share all relevant information? Much of the shopping process in travel is anonymous, and even where the customer is known, the information that a supplier gets about them may be dated and is often limited. This is a major problem for many in the hospitality sector, especially the smaller independent properties and chains. In an age of customer-centric e-commerce, this lack of customer insight both inhibits the consumers from identifying needed services (e.g., a gym) during the shopping process and prevents hoteliers from differentiating their services beyond a room price in the eyes of the consumer. A lack of trust exists between channel partners as customer information is not passed through to the property resulting in an anonymous shopper and a more complex operational process (e.g., check-in, in stay services); as a result, customer information is suppressed or altered before it reaches the supplier.

With the consumer owning their identity combined with a better information flow of property attributes, consumers like Bob can choose a hotel in Atlanta that fits their location and services their needs. A single SSI for Bob also should yield an industry-scalable common shopping process across supplier and intermediary sites provided the site can interact with the SSI. The customer may get a better targeted or more relevant offer from a supplier that has a more complete view of their potential value, even beyond a specific stay. Bob can choose which suppliers and intermediaries with which he wants to share specific aspects of his personal information.

Hotels in Atlanta benefit by being able to better target specific customers who are shopping and for which the hotels are a particularly good fit, and to make relevant offers to generate more revenue.

The information to be shared is up to the consumer. Bob has the choice of what information he shares and through practice will learn that certain personal information (e.g., loyalty with other vendors, occupation, non-travel purchases) alters the offer provided by the hotel, essentially creating a more direct dialogue between the consumer and hotel.

If the hotel uses its own identity hub to store offers, then the interaction between customer and hotel can be peer-to-peer – meaning that offers can be individualized, and intermediaries are not needed to connect the buyer and seller. The hotel needs to be able to specify offers that remain "live" as long as needed, while protecting itself against changing business conditions. These may be semi-generic offers, such as a negotiated rate for employees of a company that is valid for a year but dependent on availability of a least one room and may vary with a reference rate; or they may be personalized offers that remain valid as long as there is availability and the reference rate remains within some range; or they may be offers that expire within a short period of time.

The consumer also can benefit if the hotel stores guaranteed attributes, such as the presence, hours and type of its pool, in its identity hub. Attributes could be accredited or non-accredited. attested by trusted

entities, for example a hotel that claims to be LEED-certified could have a verified credential from the LEED certification body. Because the attributes are available in a single place maintained by the hotel, the consumer should never see incorrect or outdated information, as is often the case on third-party (OTA or brand) sites.

9. DIF Components Used:

List each element of the DIF architecture that would be used in the solution, with a brief summary of its role and any requirements that might be unusual; extensions or changes that may be needed to address hospitality and travel requirements; and where use-case specific data and processes would be accommodated (including APIs and schemas). Include a sequence diagram.

Architectural elements may include W3C Decentralized Identifiers (DID), Decentralized Data Stores (e.g. blockchains and ledgers), DID User Agents (aka Wallets), DIF Universal Resolver, DIF Identity Hubs (currently in formulation), DID Attestations, Apps and Services using SSI Data, W3C Verifiable Credentials, W3C Verifiable Presentations, W3C Resolver. For definitions see pages 9-10 of this document. This list may not be exhaustive.

Bob has to have:

- A valid W3C Decentralized Identifier (DID)
- A DIF Identity Hub (a place to store information that is referenced from the DID)
- Application on one of his devices to construct a W3C Verifiable Presentation, a subset of his W3C Verifiable Credentials
- A W3C Verifiable Credential provided by the AAA stating that Bob is a member
- A W3C Verifiable Credential provided by the government stating Bob's age or, better, with a Zero Knowledge Proof that Bob meets a supplier's minimum age requirement without disclosing his age
- A place to receive offers (such as the DIF Identity Hub in conjunction with Bob's user agent)

AAA and Acme Manufacturing each has to have:

- A valid W3C Decentralized Identifier (DID)
- Their own W3C Verifiable Credential(s) (to prove that they are who they are)
- An application to construct W3C Verifiable Credentials

The hotel has to have:

- A valid W3C Decentralized Identifier (DID)
- Their own W3C Verifiable Credentials (to prove that they are who they are)
- The capability to construct a (potentially customized) offer for Bob
- Ideally, a DIF Identity Hub populated with information that may be needed to construct and verify offers, and that can store offers that may remain valid for a period of time. This enables the hotel to make offers that may change or become invalid over time; it is not strictly necessary for an offer that is guaranteed to be open for some period of time.
- A DIF Identity Hub populated with search criteria that may be relevant, such as presence of a gym. It is possible for the hotel to not have this, but then it must have a reservation system that will not respond to a request for a hotel that includes the requirement of a gym.

Sequence Diagrams:

Figure 1: *Offer Creation / Presentation Diagram*

(Note that for brevity diagram assumes resolution of PK Infrastructure and does not show Bob's reciprocal verification of hotel/supplier's credentials)

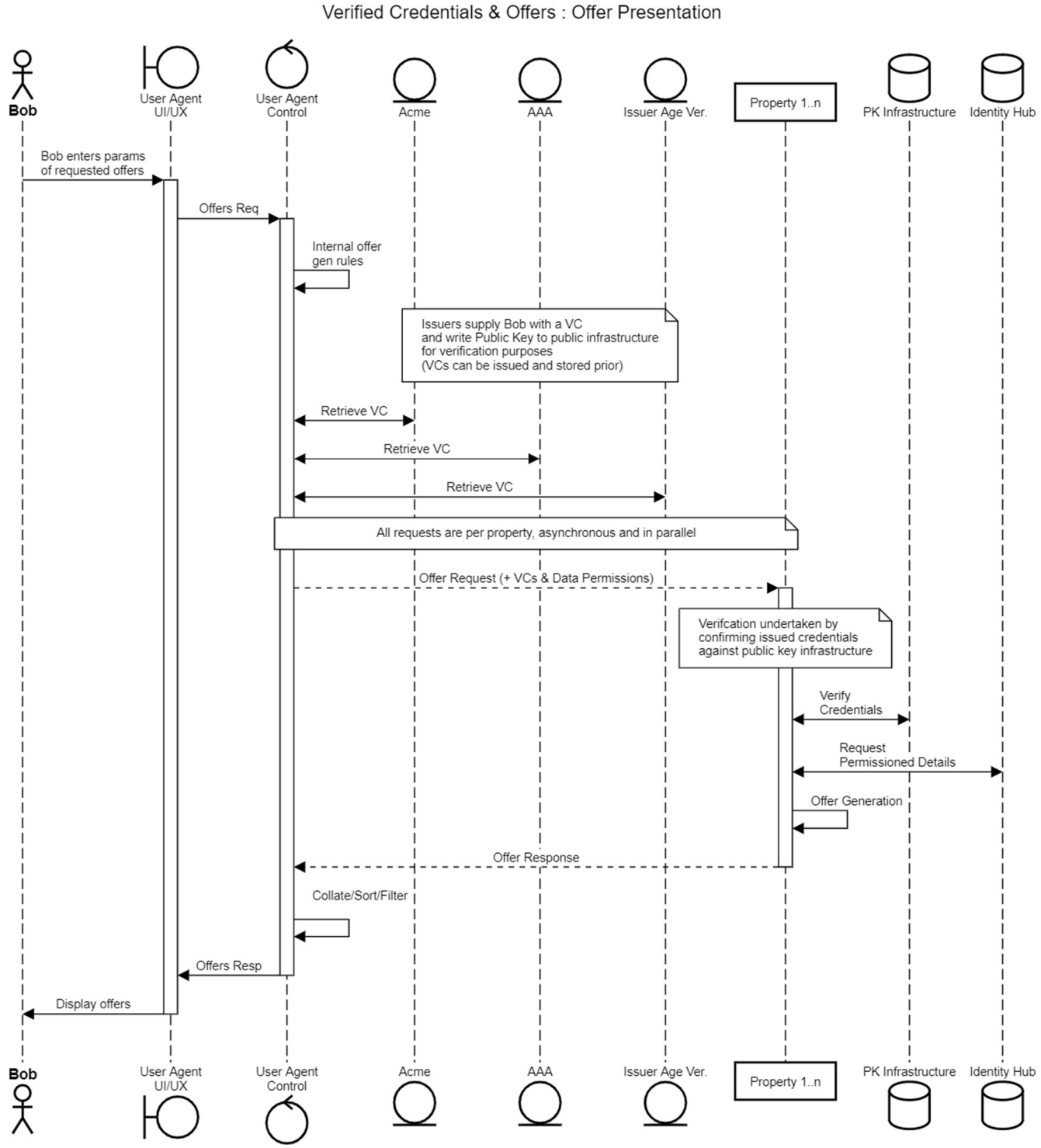
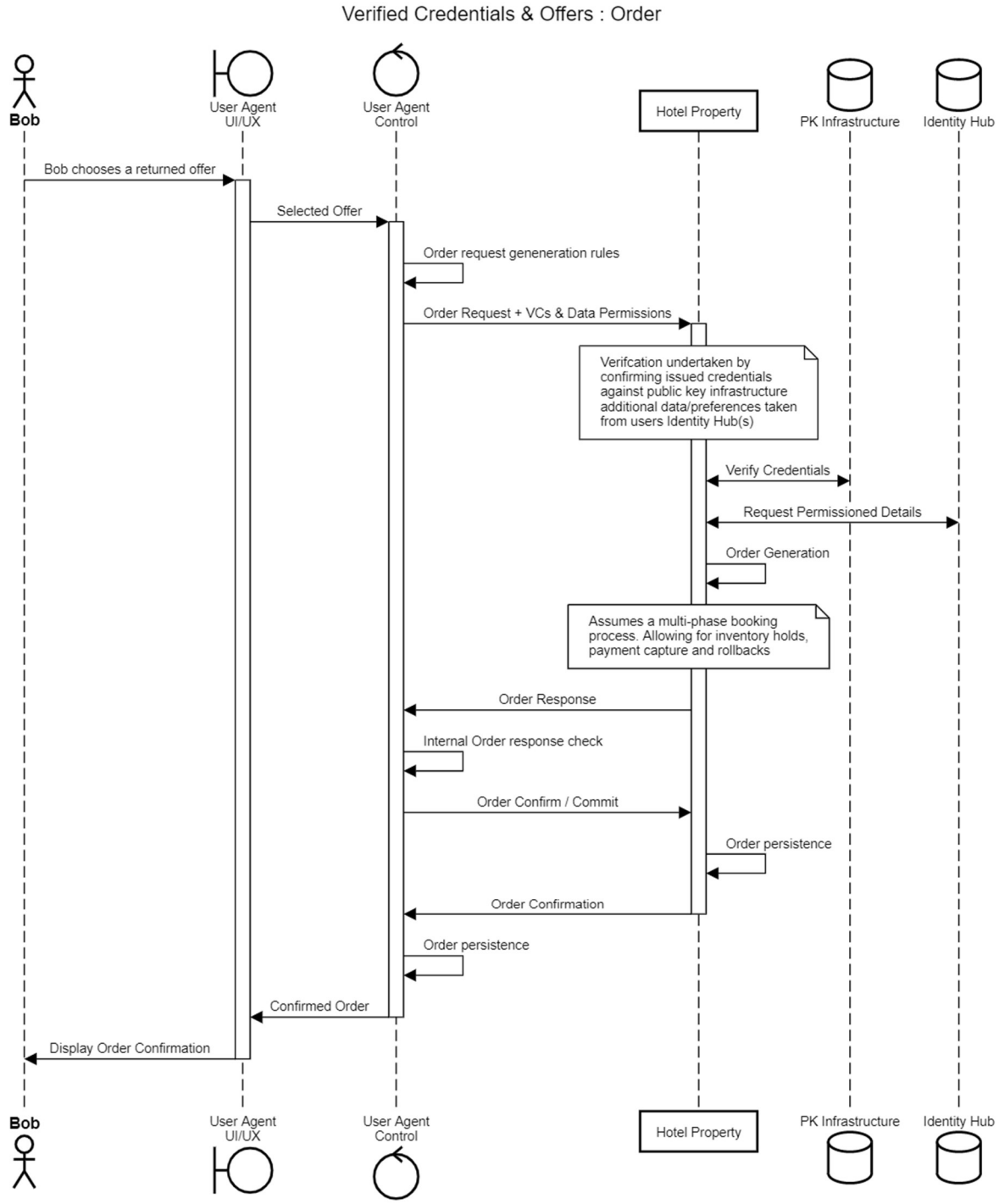


Figure 2: *Order Creation*

(Note that 'Hotel Property' could also be a tech vendor or intermediary acting on behalf of the property. A multiphase commit processes is assumed on booking during which payment would be taken but payment capture is omitted from the diagram)



10. Trust Considerations

Where is trust required (and by implication not currently present) for a presented identity or credential to work in the real-world travel domain? Who or what might realistically provide the necessary level of trust?

Bob claims he works for Acme Manufacturing, but there is no way for the hotels to know if that is true. There may be some level of trust if the hotel is booked through his corporate travel department or booking app, because Acme's negotiated rates are not publicly available, but Bob may choose not to use this, or may not be eligible if the trip is for personal business; as a result, most hotels will simply trust Bob's claim that he works for Acme. This is a known source of significant rate fraud for hotels but they have no practical way to enforce it in most cases. A corporation with a DID could potentially provide a verifiable credential to close this gap. It would be simple for hotels to get the DIDs of their corporate accounts because they already collect other information at the time of contract negotiation.

Bob has an AAA membership but knows that few hotels verify this; one major chain does require that he enter his membership number at the time of booking and validates it with AAA, but most hotels simply say that anyone using the rate must present the card at check-in. However, Bob's experience is that very few hotels check his membership, and the increasing use of mobile check-in has removed the opportunity to do so for hotels that do not validate it with AAA. This is another known source of fraud for hotels. AAA could potentially provide a verifiable credential to close this gap. It would be simple for hotels to verify this using the DID of the AAA organization.

Bob has a Citibank World Mastercard, which has an arrangement with a major hotel group that provides a discount plus free premium internet for the duration of his stay. The hotel typically requires that the room be booked through direct channels and the credit card be provided for guarantee or deposit at the time of booking, and the hotel can verify the card type by the first six digits of the card number. The potential for fraud is low, but there are some edge cases where Bob borrows a friend's card to get the rate, and then provides a different card at the hotel. The bigger issue here is not trust, but the requirement to share a credit card number that the hotel may not otherwise need (for example if the booking has a direct-bill arrangement and the terms of the credit card offer do not require that it be used for payment). If needed, however, Citibank could provide Bob with a verifiable credential to close the gap.

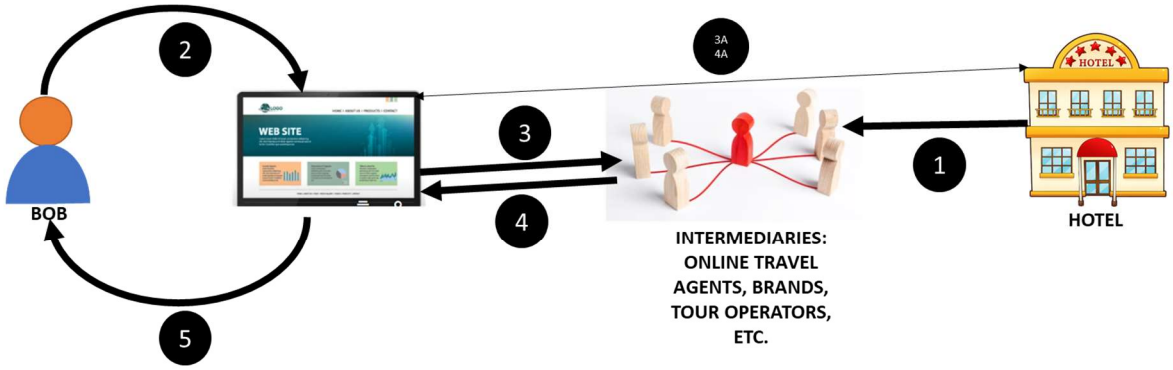
Bob is 63 years old and entitled to a senior discount at many hotels. Today, most hotels say that Bob will need to provide proof of age at check-in, but many people know that front desk clerks rarely check (even when they look at ID), and the increasing use of mobile check-in means that there may be no place in the process to perform an age check. Especially in the case of mobile check-in, the hotel simply assumes that the guest is old enough, and this can be a significant source of fraud especially because most senior rates are similar to nonrefundable rates available to everyone but are fully refundable. A government agency that issues identification cards could provide a verifiable credential indicating that Bob is at least of an age that entitles him to the senior discount, and Bob could provide this at the time of the reservation. Ideally this could be provided as a Zero Knowledge Proof based on the hotel's specific cutoff age.

11. Current vs. Proposed System Topology

Describe (visually if possible) the flow of information and parties involved (e.g., suppliers, B2B tech vendors, consumer apps) as the problem is handled in the current environment, highlighting any anomalies or challenges; also contrast the proposed environment.

The typical current process is depicted in Figure 1. Hotels often get no information about the consumer whatsoever, or in the case of a hotel brand they may have some poor-quality, often out-of-date data if Bob is a member of their loyalty program. Bob has a frustrating experience because there is no ability to get the answer to a simple question: given all my entitlements, what is the best rate at each hotel; he must generally search each hotel individually, once for each rate plan.

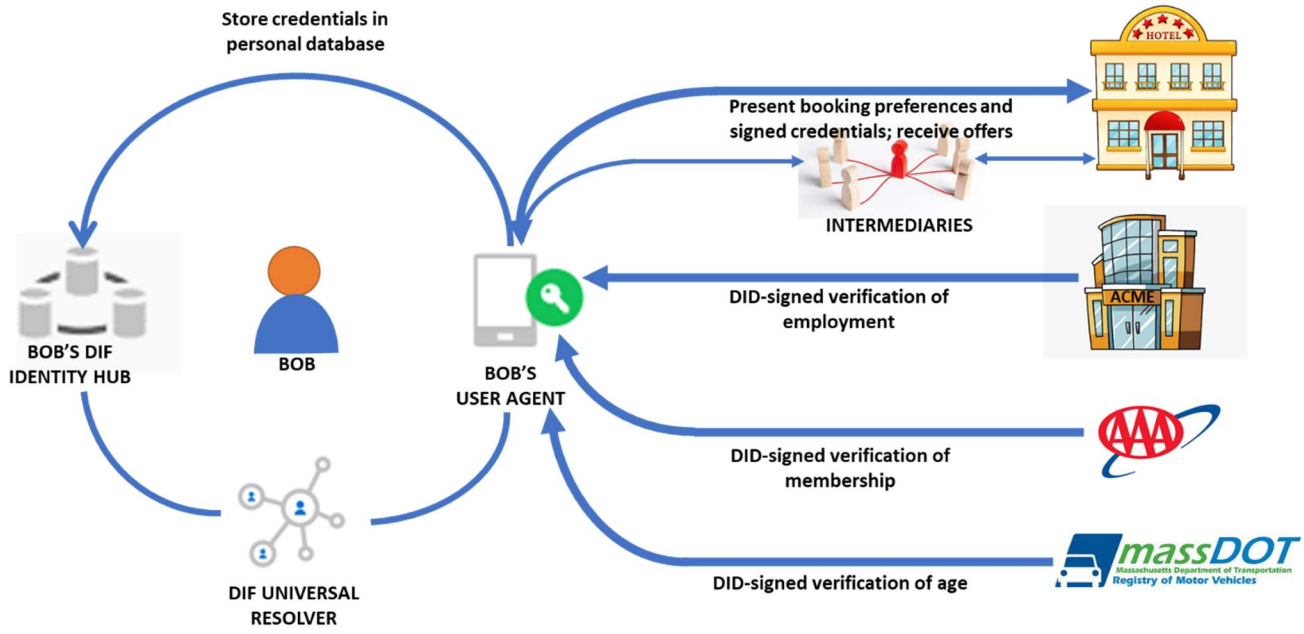
Figure 3: *Typical Current Process*



1. Hotel advises intermediaries of rates and availability. While brands are often aware of many or all special rates, most online travel agents receive only one or two options.
2. Bob uses website (e.g. Hilton, Expedia, or hotel website) to specify hotel(s) or area(s) of interest, dates, and (if supported by website) AAA, senior, or corporate rate. Most sites only support a request for a single special rate at a time and most online travel agents do not support special rates at all.
3. Website requests rates for hotels meeting search criteria from one (or sometimes multiple) intermediary(ies). Bookings may also be routed directly to hotel (3A) if hotel has its own website (rare) and Bob uses it (also rare).
4. Intermediary (or hotel, 4A) returns a set of rate options for display on website.
5. Bob reviews options and may select one to book. Since Bob has multiple options for discounts, he will need to note the best rate and repeat the process to check the other options, then return to the best one to book it.

With DIF, where the hotel does not have an identity hub, the process is shown in Figure 2. Credentials for Bob's age, employment, and AAA membership are signed by the relevant parties, stored in Bob's DIF Identity Hub, and presented by Bob's user agent, along with details of his booking request (location, dates, gym requirement), to hotels and/or intermediaries selected by the user agent. The user agent collects responses, selects the ones best fitting Bob's criteria (location and price), and presents them to Bob to choose and book one.

Figure 4: *Process with DIF if hotel has no Identity Hub*



In Figure 4, the offers must either have a time limit (such as valid only for five minutes) or must be subject to verifying that there is still availability (since the hotel could sell out between the time the offer is made and the time it is accepted). While common today, these are mechanisms are suboptimal; poor synchronization often leads consumers to see many false offers that cannot be confirmed, causing both consumer frustration and lost business to the hotels.

If the hotel has its own DIF Identity Hub, then rather than sending the offers directly to Bob's user agent, it can store them in the Identity Hub, along with rules and/or service endpoints that can be used by Bob's user agent to determine the rules. These rules might, for example, state that the offer is valid for an entire year but subject to availability (common with corporate negotiated rates), or that it is valid as stated for 15 minutes only, after which it is subject to availability and the rate is subject to revalidation. This approach gives Bob (or his user agent) more time to make a decision which hotel to book, protects the hotel from overbooking, and allows the offer to be long-lived if the hotel wants it to be. The mechanics of this are not depicted visually.

12. Blockers and Enablers:

What are the barriers to implementing SSI for this use case? What work is already being done elsewhere that can be leveraged? For example, does a network of trust need to be formed so verifiers do not need to create an unmanageably large list of known issuers? If so, are industry groups or governmental agencies or B2B tech vendors already working on the problem, or would it need to be a ground-up effort? Would key players likely support or resist the new approach? Note that barriers and enablers may have no impact on the validity of the use case but might be useful in prioritizing efforts that face fewer barriers to implementation.

Blockers:

- Customer identity and profiles exist in a variety of systems within the travel ecosystem. Currently most of these user identities are stored centrally and controlled by a travel supplier or intermediary and are triggered by a log on to a supplier or intermediary site. The consumer currently has no control on how PII is stored and what parts of their PII is used to develop a quote. A shift to SSI/DDID requires a change in this approach to customer data and all parties will need to understand the benefit to embrace this shift.

- The fragmented hotel tech stack is a barrier. B2B tech vendors who serve the lodging sector must be made aware of the value SSI/DDID provides to adapt their systems to integrate specific consumer PII, including preferences referenced in user identity hub, as a basis for the creation of offers.

- A network of trust is required to verify eligibility for specific discounts and offers. Large entities in specific segments such as corporate travel programs may experience resistance from established partner travel intermediaries who may use control of identity as a level through which to control the travel booking process. Allowing current intermediaries to control this trust verification, further centralizes the booking process and conflicts directly with the SSI/DDID objective.

- Evolution of the hotel tech stack will be required to integrate with identity hubs and to be able to construct and present offers as VCs. For maximum benefit, we envisage a hotel identity hub to contain:

    - Attributes about the hotel (such as features and amenities) and its products
    - Verified credentials attesting to offers it has made (potentially with smart contracts or similar peer-to-peer mechanisms that determine things like period of validity, whether and when they are subject to inventory availability, and other contractual terms of the offer)
    - A real-time or near real-time inventory cache
    - Various service endpoints

Enablers:

- A hybrid environment will exist for some time. To drive true decentralized SSI, pilots need to be created by early adopters to demonstrate the value of SSI to all stakeholders.

- A considerable number of new hotel companies have appeared during the last five years, many with new-built tech stacks, and all targeting the young digitally equipped consumer. These small to mid-size companies are the hotel industry's innovators and early adopters. POC focus should target these companies.

- Digital health credentials, many based on SSI/DDID, will become common in many parts of the world this year (2021) as travel restrictions ease. The experience of storing and using credentials in a common identity wallet may serve as early pilots to introduce consumers and travel suppliers to the future opportunity for SSI/DDID.

- Pilots should embrace use case scenarios where value is created for all parties by better matching offers with customer preferences.

- There are currently several 3rd party companies and organizations offering decentralized identity solutions. DIF H&T SIG can act as a conduit to introduce qualified SSI/DDID practitioners to interested travel suppliers and travel tech vendors wishing to onboard SSI/DDID technologies.
- The current regulatory environment (GDPR, CCPA, etc.) has been moving rapidly to consumer self-control of PII and will continue to do so, making this approach more viable for companies striving for compliance.
- The large number of PII data breaches and fines assessed have raised risk awareness among travel suppliers with respect to stored PII and made it more attractive to store less PII data.
- Even without breaches or other major events, organizations must actively comply with and support the rights introduced by these acts. For example, an EU consumer can ask for details of all of their personal data, an explanation for what that data is being used for, withdraw consent for the use of that data (for certain or all purposes) and also ask for it to be erased. Organizations need to have the ability to respond to such requests in an accurate and timely manner or face fines/sanctions.

13. Contributors

Contributors to this use case, and the discussions leading to it, are listed below. Many thanks to all for their efforts and insights.

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