Decentralized Identity Foundation

Hospitality & Travel Special Interest Group

Use Case Developed by Verifiable Credentials & Offers Team

FINAL – 23 September 2021

1. **Use case name:** Verified Hotel Stay

2. **Short Description:** Captures actual activity resulting from a hotel booking, to provide employees and employers with a more automated expense reporting, to shield employees from having to share nonreimbursable items on their hotel folio with their employer, to enable travelers to share a richer stay history with hotels in the expectation of receiving more relevant offers or upgraded treatment, and to enable travelers to provide proof of an actual stay to social media sites when posting an online review.

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.

Alice is an employee of Acme Corporation, a midsized company that has negotiated rates with numerous hotels. While Alice uses the negotiated rates, she sometimes finds better rates in other channels and books through them to save money; however, when she does so, she still identifies herself to the hotel as an Acme employee, in order to take advantage of automated expense reporting (where available).

While Alice receives e-receipts at some hotels she uses, others do not participate, and with them, she only gets a paper or PDF receipt.

After each stay, Alice checks out and receives a verified stay credential documenting the stay and line-item folio details. Alice can immediately review each line item in an identity app on her phone, identify any personal charges that should not be submitted for expense reimbursement, and click a button to share proof of the stay and details for the reimbursable line items to the Acme expense reimbursement process, so that she can be automatically reimbursed. The personal expenses are not shared with the employer.

Alice is frustrated that she often stays at new hotels but when she does, she is rarely recognized as a very frequent traveler and good spender. When Alice stays at a hotel or brand for the first time, she wants them to understand that she spends significant amounts of money when she stays in hotels. She therefore often presents prior verified stay credentials from other hotels to prove that, in the hopes that she will get more relevant offers and/or better treatment.

Alice often writes reviews on TripAdvisor for the hotels she frequents. With her verified stay credential, she is able to provide proof when she posts a review that she actually stayed in the hotel on specific dates, meaning that TripAdvisor can identify the review as "verified" and users can have more confidence that it is a credible review.

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)?

At present, there is no digital way for a guest to prove that they stayed at a hotel, or what they spent. The exception is that some hotels, credit card companies and corporations cooperate to facilitate expense reporting by providing line-item data, but this is typically limited to charges on corporate cards and to participating hotels and employers, and may require the guest and the hotel to arrange a separate folio and payment for any nonreimbursable charges incurred by the guest during his stay; or the corporation may have to charge the personal expenses back to the traveler when discovered during an audit. Many companies also do not receive the line-item data because it carries a cost.

Additionally, the guest may have multiple reasons to want to be able to prove that she stayed at the hotel on specific dates and spent a certain amount of money. This can allow her to post a verified review on independent social media sites; today verified reviews can only generally be posted on the site through which a booking was made, and even then may be associated with a booking that did not result in a stay (for example, a hotel could make a booking through the site, cancel it in their own system, and still post a "verified" positive review because the booking site is unaware that the booking was cancelled.

Today, folios are rarely delivered in a digitally readable form, the exception being when the hotel and corporate travel department participate in a reporting program administered via a credit card company; even in this case the folio may be inaccurate for expense reporting purposes if (a) charges were split across multiple credit cards by the guest, or (b) nonreimbursable expenses were included in the folio total. Otherwise, folios are delivered primarily via PDF document to the guest, and generally require manual review and entry on a form for expense reimbursement. Verified stay credentials, on the other hand, are fully digital, parsable, and can be presented as a Verifiable Claim for the specific line items that are reimbursable, without the need to present the entire folio.

The guest may want to prove certain activity in order to qualify for an offer with another merchant. For example, the guest may want to register for a loyalty challenge with a different hotel company, and be required to prove that they have enough activity with their current preferred company to qualify. Or a guest who spends lavishly at many hotels may want to share the proof of that spending with hotels they are staying at for the first time, in the hopes of preferred treatment (and indeed, many hotels would want to provide such treatment for guests of sufficiently high value). Presenting prior line-item stay by category could also be used by the guest to request a customized offer from the hotel.

The use of verified credentials to document the key events related to a hotel booking and stay ensure that the traveler can control the disclosure of information (for example, selectively disclosing folio details to an employer when part of a stay may have been personal and not reimbursable), and that the information reflects the accurate value of the stay.

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.

- Alice has a User Agent that supports SSI.
- The Hotel (or intermediary) can issue Verifiable Claims as proof of key events during a guest's stay
- The User Agent and Hotel (or intermediaries representing them) are conducting real-time, secure, peer-to-peer communications.
- The Online review/comparison website can accept Verifiable Claims as proof of stay
- Alice has an identity hub for storing Verified Credentials documenting stays and folio details.
- Alice's User Agent can manage and present Verifiable Claims that document verified stays from previous stays / hotel interactions
- Alice's User Agent can present these collated claims to other hotels or other travel suppliers as Verifiable Claims
- Hotel can accept a guest's Verifiable Credentials
- Hotel has a DID
- Acme has a DID that the hotel knows and trusts
- The hotel has a universal resolver
- Acme can issue Verifiable Credentials for employees
- Acme can accept and process Verifiable Claims as proof of stay / events during that stay

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 Travel Provider, one travel review site, one customer and their employer
- Use of zero-knowledge-proof derived predicates within the Verifiable Claims events

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.

Improving the mechanisms for sharing information between parties engaged in the corporate employee hotel booking pipeline (traveler, employer travel manager, hotel) by the relevance, accuracy, and real-time exchange of information, provides an opportunity for process improvement through simplification.

The improved expense reporting process will create:

- Greatly simplified employee travel expense reporting – time saving, greater accuracy, faster reimbursement, and happier employees.
- A reduction in customer PII shared, limited to only to information concerning any legitimate business expenses incurred during the hotel stay.
- For those hotels set up for VC expense reporting, an improved ability to contract with corporate customers – happier guests incented to stay.
- A peer-to-peer data flow between the hotel and the customer, eliminating the need for intermediaries such as credit cards and travel and expense software.

For the traveler (Alice), the ability to create an accurate, aggregated view of travel purchase, and to present this information simply when needed such as when making a booking, creates an opportunity for H&T new loyalty models to be created for the modern age, and centered around the consumer rather than travel provider. Rather than rewarding the customer with more of the same product purchased, or discounting the price, the opportunity exists to provide the customer with a high value reward based on profile information and prior spend across many sectors including H&T.

A reward for information provided model using micro-payments is a likely outcome of verified consumer purchase aggregation.

The verified review process with improved expense reporting will create:

- A positive contribution to hotel ADR (Average Daily Rate): Happy customers are more likely to post positive reviews, and the reviews are more trusted and valuable to the hotel because they are verifiable.
- Motivation for some consumers to select hotels based on the availability of verified stay credentials and/or simpler expense reporting.

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.

Alice has to have:

- A valid W3C Decentralized Identifier (DID)
- A DIF Identity Hub (a place that matches a DID and DID Document)
- Application on one of her devices to construct a W3C Verifiable Presentation, a subset of her W3C Verifiable Credentials

The hotel 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
- A DIF Universal Resolver

Alice's employer 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 read (and validate) W3C Verifiable Credentials
- A DIF Universal Resolver

Review sites such as TripAdvisor that want to flag verified reviews must have:

- An application to read (and validate) W3C Verifiable Claims
- A DIF Universal resolver

Sequence Diagrams:

Diagram detailing stay and checkout (next pages)

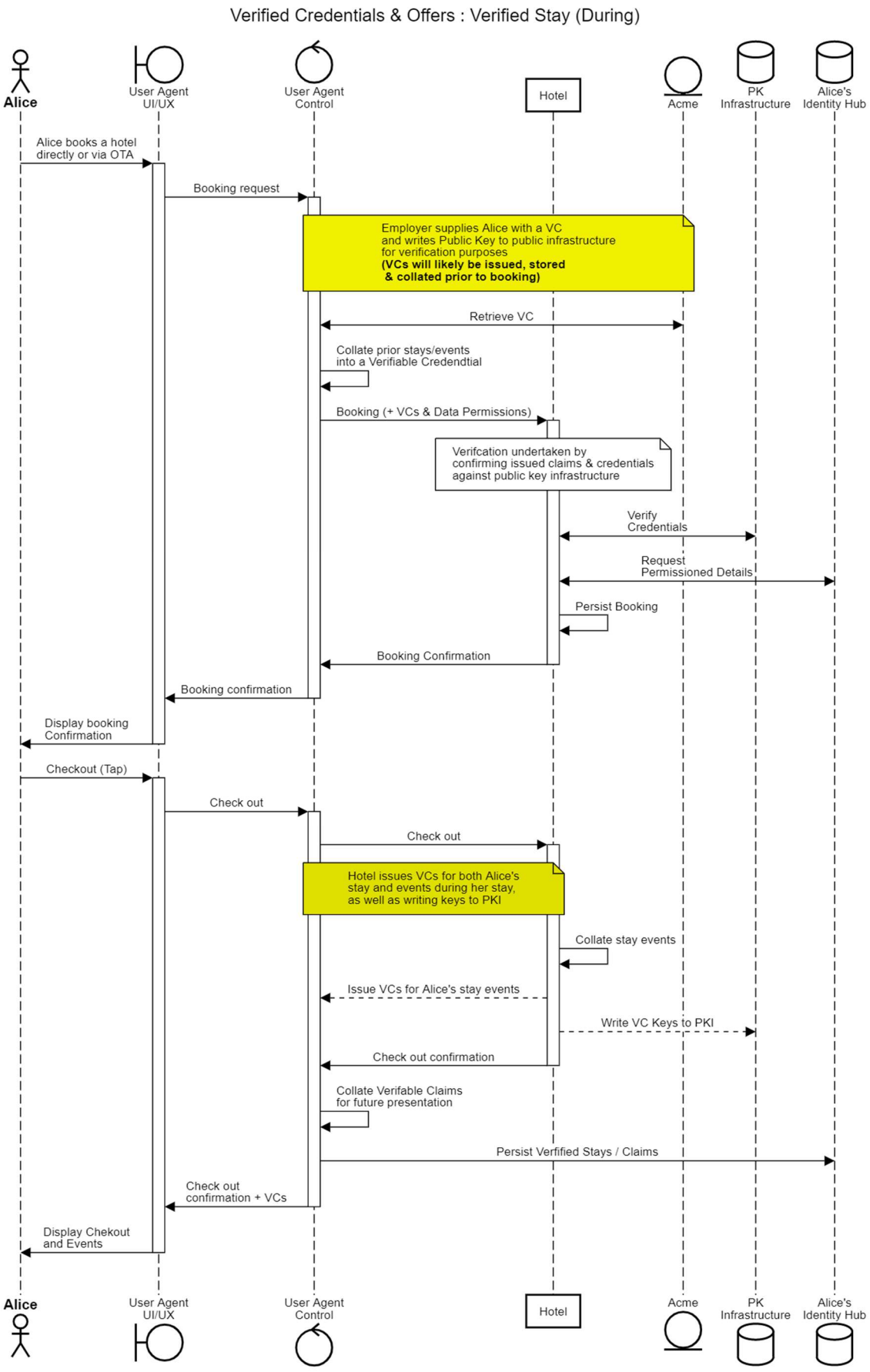
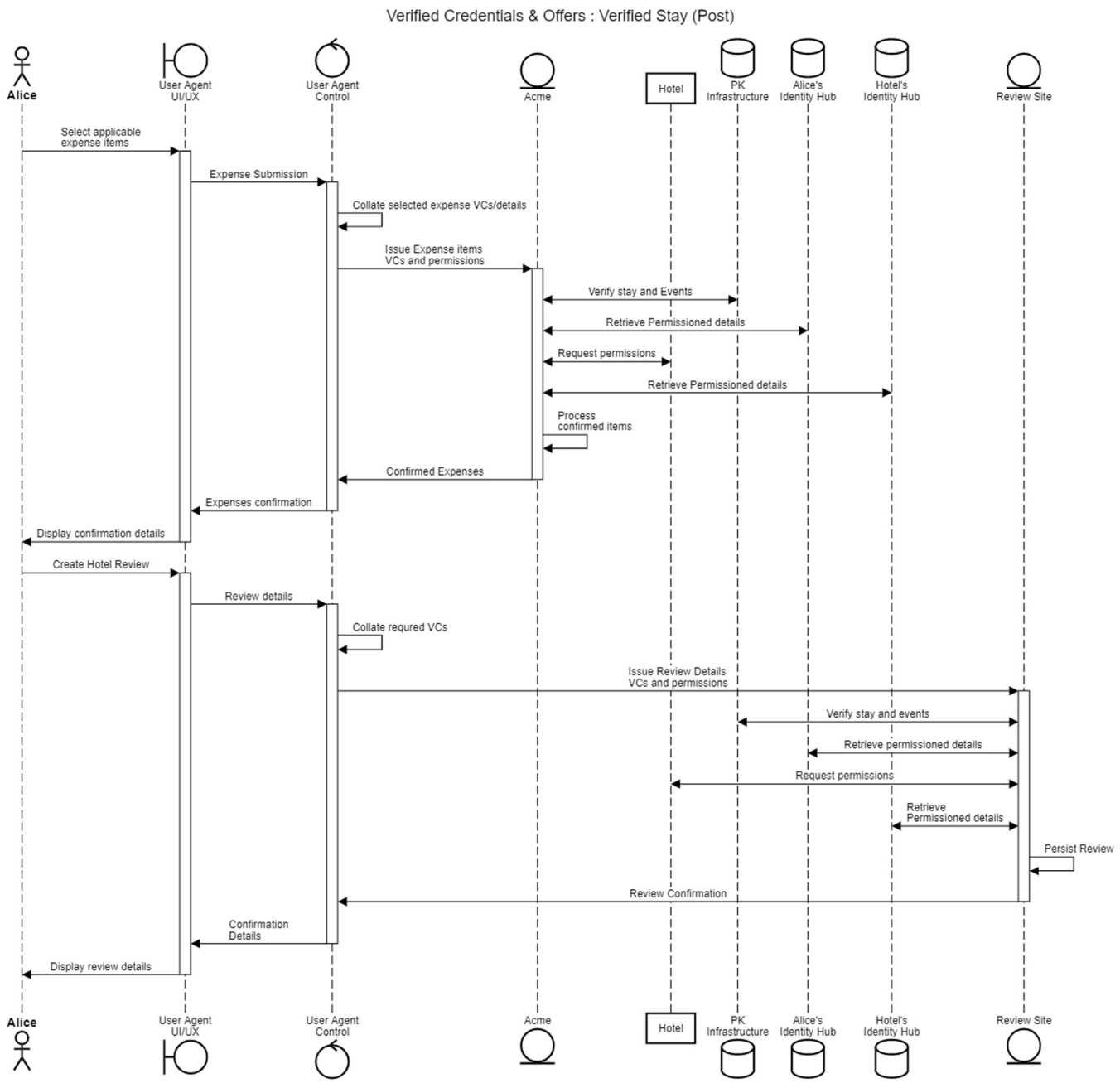

Verified Credentials & Offers : Verified Stay (During)
Alice
User Agent UI/UX
User Agent Control
Hotel
Acme
PK Infrastructure
Alice's Identity Hub
Alice books a hotel directly or via OTA
Booking request
Employer supplies Alice with a VC and writes Public Key to public infrastructure for verification purposes
(VCs will likely be issued, stored & collated prior to booking)
Retrieve VC
Collate prior stays/events into a Verifiable Credendtial
Booking (+ VCs & Data Permissions)
Verifcation undertaken by confirming issued claims & credentials against public key infrastructure
Verify Credentials
Request Permissioned Details
Persist Booking
Booking Confirmation
Booking confirmation
Display booking Confirmation
Checkout (Tap)
Check out
Check out
Hotel issues VCs for both Alice's stay and events during her stay, as well as writing keys to PKI
Collate stay events
Issue VCs for Alice's stay events
Write VC Keys to PKI
Check out confirmation
Collate Verifable Claims for future presentation
Persist Verfified Stays / Claims
Check out confirmation + VCs
Display Chekout and Events

Diagram detailing post stay



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?

The main aspect of trust that is needed and not currently present is around verification that a stay credential was issued by a legitimate hotel or other accommodation facility. Without this, a traveler

could create her own stay credential for a hotel that does not exist in reality, and submit it for reimbursement (perhaps after spending the night with a friend). This will not be a big issue for hotels with which the corporate account has a negotiated rate; presumably at the time the rate is negotiated, the two parties can exchange DIDs so that they can trust future transactions.

Review sites also require this trust, but because they already maintain a list of hotels that are available for users to post reviews, it would be a one-time exercise for them to match it to a list of valid hotel DIDs. This might start with a list purchased from a third party, but they would need to request DIDs from hotels not included in that list, and (since most would likely not answer) allow hotels who get (or want to register) DIDs at a later date to submit them for future use. There is the potential for fraud here, although it is not hard to imagine that review sites could implement procedures to ensure that only the hotel itself submits its DID. Over time, the ability to purchase a more complete list from a third party would presumably grow.

Thus, two situations, reimbursement for travel at a hotel where the company does not have a negotiated rate, and review sites, would benefit from a master list of DIDs for all hotel and accommodation providers that have them; this may offer a commercial opportunity to a company (perhaps in the distribution space) to provide such a list.

11. Current vs. Proposed System Topology

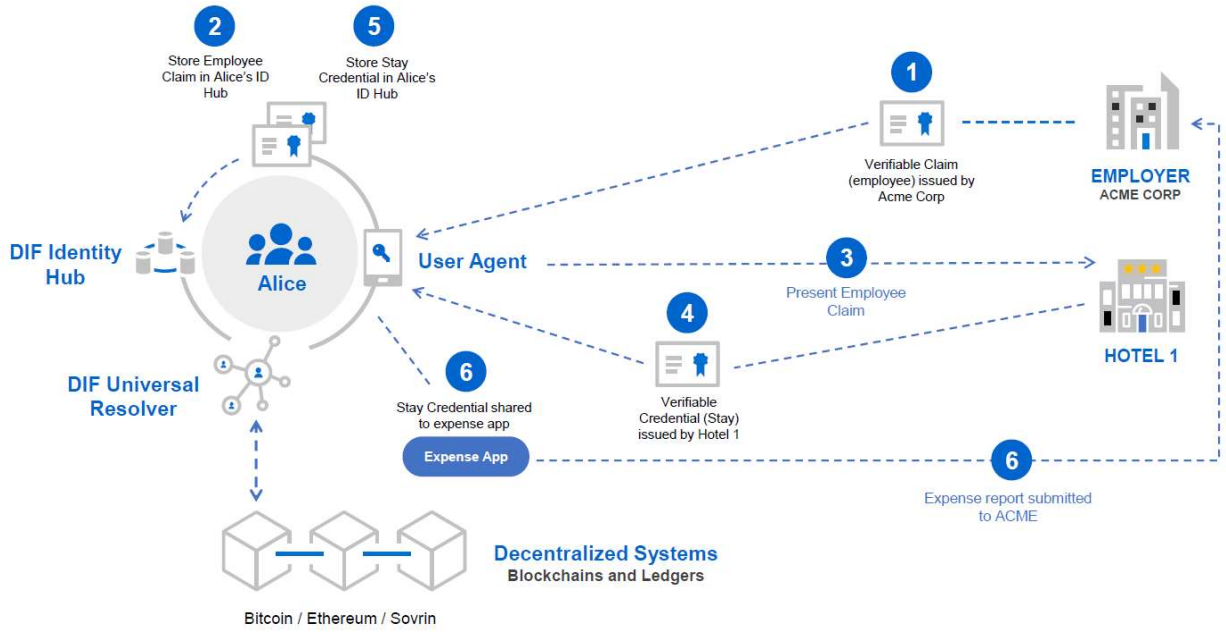
Describe (visually if possible) the flow of information and parties involved (e.g., suppliers, B2B tech vendors, consumer apps) as the problem is handled in the current environment, highlighting any anomalies or challenges; also contrast the proposed environment.

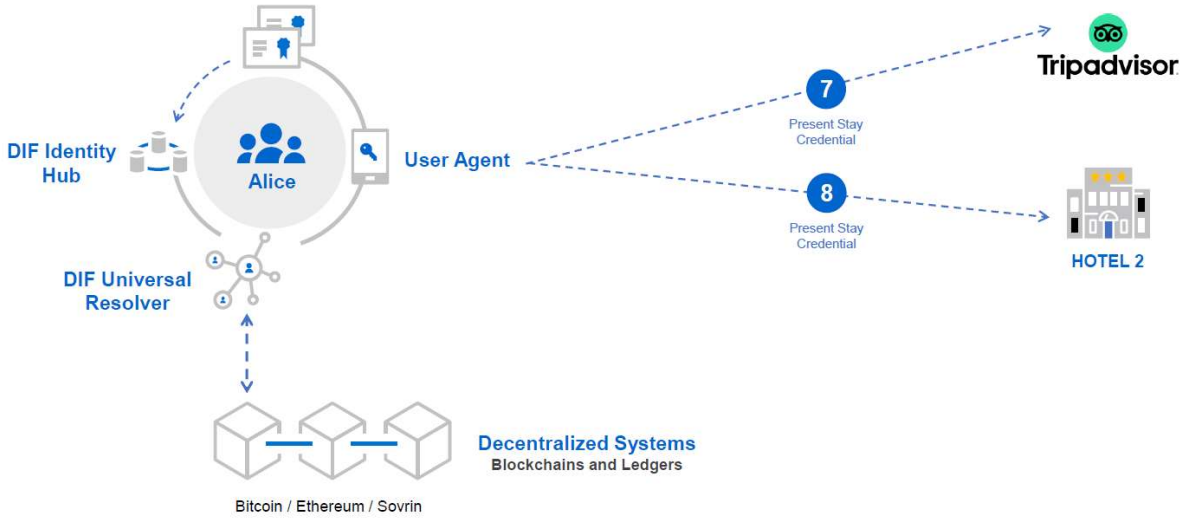
The current topology for expense reporting varies substantially from hotel to hotel and company to company. Some hotels and some corporate travel departments support electronic folio delivery through credit card companies, but coverage on both sides is limited, so much expense reporting is still based on paper or PDF receipts with manual identification of reimbursable vs. nonreimbursable items.

For online reviews, verified stays are possible only on the site where the traveler booked, or in a few cases on sites of business partners. In this case travelers may not trust that the site (such as a hotel website) displays all reviews good or bad; trusted neutral sites such as Tripadvisor are unable to verify that reviews are only made by actual guests.

For loyalty challenges, travel providers who offer them generally rely on evidence such as printouts or screenshots of activity from other travel providers, although these can be easily forged.

The proposed topology, outlined in the two diagrams below, shows the use of Verified Credentials to prove the activity in each of the use cases. The first diagram covers expense reporting, while the second addresses verified reviews and loyalty challenges.





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:

- Lack of SSI adoption will inhibit the realization of this use case

- The User Agent capability of selecting folio line items for sharing might be seen as a niche feature that developers will not get to in early iterations of User Agents
- Requires deep interoperability across User Agents on one side; H&T Providers on a second side; and Expense Reporting applications and Review Sites on a third
- If not enough hotels provided verifiable stay credentials, the usefulness to Alice is limited.
- Corporate expense processes must be prepared to accept verifiable claims as proof of expenses.
- Hotels need to be prepared to accept verifiable claims and use them to customize offers, loyalty matches, or other benefits.

Enablers:

- Simplifying and increasing the accuracy of expense reporting will drive adoption by both business travelers and corporate travel managers
    a) Corporate travel managers are well-positioned to encourage hotel companies to become SSI-enabled to support verified stays and more-efficient expense reporting
- Likewise, reviews from a verified stay will be seen as more reliable and trustworthy than others, pushing adoption by review sites and also suggesting that the review sites encourage travelers to use the VC to authenticate their reviews, driving consumer adoption
- A truly "universal" Universal Resolver will enable rich interoperability
- Hotel management system companies might build verifiable stays into their base products to enable their hotels to participate.

13. Contributors:

The following individuals participated in the development of this use case.

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