# **Project VISH**

### Verification Info Sharing Hub

Proof of Concept (POC)

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### **Project Background**

### Importance of digital identities in the financial industry

Digital identity is a set of validated digital attributes and credentials in the digital world and it is playing a foundational role in the digital economy.

A digital identity is a convenient way to prove our identity when we access financial services as verifiable identities provide a trusted and reliable way to prove who we are.

The benefits of digital identities are immense:

- Security Digital identities help prevent fraud and identity theft by ensuring that only authorized individuals have access to financial accounts and transactions. By using multifactor authentication and other security measures, digital identities can help keep risks and frauds at bay. As more and more transactions take place in the digital world, making sure our identity is managed in a safe and secure manner is critical to establishing trust in customers.
- 2. Convenience Customers can easily access financial solutions and the reusability of digital identities saves them from the need to create and remember multiple user accounts.
- **3.** Innovation The convenience of digital identities has sparked off new products and services which in turn provides customers with more options with enhanced user experience and raises the bar for innovative products.

Where used securely and safely, digital identity becomes a key enabler for digital transactions and enables trust online.

### The potential of reusable digital identities

A key component in the entire process that determines the success of using digital identities is identity verification. Our research has shown that the identity proofing process is costly in terms of time and money and will only get costlier. In the financial world, the difficulty in verifying customer identities in a cost-effective manner is still one of the biggest operational challenges and hinders business growth. Most Know-Your-Customer (KYC) processes still generate some form of friction such as long processing time, manual and in-person document checks and may require numerous follow-ups where necessary.

Reusable digital identities allow users to present one set of digital identity to be used across platforms, service providers. It also provides an opportunity to streamline KYC processes, simplifies the process of data sharing, and offers a potential opportunity for FIs to leverage the same set of identity for the same individual.

Today, most of us will be familiar with presenting a form of identification when we open a new bank account or apply for loans etc. We are required to provide personally identifiable information (PII) such as NRIC, Date of Birth, Home Address for verification purposes and we could be doing this repeatedly for the same purpose on different occasions. Our POC therefore attempts to look at how we could harness the potential of reusable digital credentials while ensuring reliability and security in



order to alleviate customers from such experiences and also benefits businesses which need to perform KYC checks.

We know for a fact that identity verifications have always been important when accessing financial services, e.g. account opening or applying for bank products. In order to comply with regulations and safeguard their risk exposure, FIs are required to conduct KYC/AML checks continuously throughout the customer lifecycle to weed out bad actors along the way.

While we live in a digital world today, some processes involved in KYC still require human intervention where machines are unable to fulfill. This could suggest there is still a gap in the technology used in the market today or a business process that is so deeply entrenched in the traditional ways of needing to be 'doubly sure'. Our POC is centered around the idea of a platform called Verification Info Sharing Hub (VISH) that will enable participating FIs to collaborate on identity proofing in an open, secure and compliant manner, making identity verification more efficient for the entities in the ecosystem. VISH will enable the participating FIs to receive the best and most recent available verification info about the customer from each other transparently.

### Why should FIs collaborate on customer/verification info?

VISH endeavors to streamline user onboarding process to new products and reduce user friction is one of the primary drivers for adoption. VISH can also eliminate repetitive works and replace the existing complicated identity verification process.

Ideally info sharing is always at the discretion of the user and is user consented. It is true that the target participants might be competing organizations, data/doc vendors and/or non-commercially inclined authoritative sources. But it is also not uncommon for competitors to collaborate for mutual benefits.

It is ultimately a win-win solution between FIs and end users. FIs can avoid the need and reduce the cost of re-verification when all the profile data is available in the network of a verified state. This is a huge driver because stale info is both a business and compliance risk. Currently there are no efficient alternatives for keeping identity refreshed. All participants stand to benefit from this collective wisdom.

### What is the business opportunity in solving this market problem?

Digitalization processes have been speeding up in the financial industry recently. From customer perspective, by properly managing the digital identity of the customers can also lead to increased customer loyalty and revenue. Customers will always favor data-driven organizations which offer better digital customer journeys. With blockchain technology, VISH has improved security posture with advanced authentication and increase data and privacy protection and have more tightly controlled data access rights.



### **Project Scope**

This whitepaper presents a vision of how we can reuse digital identities and the ease of implementing the proposed model as validated during the course of developing the proof-of-concept (POC). We also hope to that by documenting our approach, findings and learnings, it can benefit readers who may be exploring similar models.

### Why blockchain was selected

Blockchain technology has evolved significantly and it has now replaced traditional systems with highly trusted mechanism of managing digital identities. Blockchain helps to make digital identity management more secure and flexible. It also empowers users to have greater control of their own identity and it has the potential to change the way on how we can reuse identities across different organizations.

Here are the advantages of applying blockchain with digital identity:

1) Secure: Blockchain can maintain data in an immutable and encrypted manner. It can help to ensure that the digital identity is secure and also solve the problem of vulnerability due to password protection.

2) Trust: Identity can be traceable, auditable and verifiable within few seconds. Issuers can easily connect with other FIs and provide instant verification of credentials.

3) Private: Only permissioned network participants have the access and all processes are tamperproof and permanently captured on the blockchain network.

By enabling the digital identity space using blockchain, it has significant benefits for both individual end users and FIs across the world. It translates to huge cost savings for FIs and this would also mean a significant improvement in security and user experience. The expectations on the customers' side have changed nowadays. Using digital Identity can simply enable the creation of secure and frictionless experiences for end users. They want a seamless experience and also demand more security and protection as they want to make sure their data are kept private and secure.

### **Conceptual Overview of VISH**

Verification Info Sharing Hub (VISH) is a verification info sharing platform built on blockchain technology. This platform facilitates the sharing of commonly used information e.g. KYC data, within a secure ecosystem of partners e.g. Fls.

With VISH, we hope to achieve the three following objectives:

- Create a network where participating FIs can reuse verified identities
- Build trust among the participating FIs network
- Minimize the identity verification cost



VISH can be used to create fully digital onboarding journeys and meeting all the KYC needs. For example: fully digitized onboarding process where verified end users can complete their applications without the need to provide documents or photos.

Below are some features that VISH can achieve:

- 1) Verifiable and trusted: Identity will only be useful if it can be trusted. It can be trusted only if participating FIs can verify the data.
- 2) Safe and secure: All verified credentials are stored privately that doesn't save any personal information to a public blockchain.

VISH also helps FIs save time, reduce costs and they will also have the opportunity to monetize on their data which incentivize network participants to collaborate to build a better KYC process. From end users' standpoint, they can enjoy from a smoother and more frictionless KYC process as they are not required to upload any supporting documents to the system separately which take a lot of time. This will enhance the overall customer experience which help to reduce drop-offs and results in higher pass rates.

### Scope of POC

The proof-of-concept (POC) sets out to validate the following:

- Reusability of Verifiable Credentials (VC)
- Cost effectiveness of reusing VC
- Ease of implementing VC

VCs are based on a Web3 (W3) data-model which is cryptographically secure and machine verifiable, as they are in digital form and digitally signed, hence making them tamper-resistant and instantaneously verifiable.

We performed an extensive feasibility study to determine whether to re-create the entire Self-Sovereign Identity (SSI) blockchain technology from ground-up or leverage third party solutions. Since the objective of the POC was to establish the ease of reusability in a real-world use case, we chose to focus our efforts on validating the concept, thereby working with a third-party technology service provider instead. We thoroughly evaluated a few technology service providers and eventually selected Trinsic, a full-stack SSI platform. Trinsic's platform offered the desired level of freedom and flexibility compared to the other shortlisted options. They provide clear documentation and ease of API integration which allowed our developers to focus on the implementation of the business logic and delegating the operation on blockchain to Trinsic via simple API calls.

For our POC, as our objective was to test our hypotheses, we chose to create a mock marketplace to allow end users to directly apply for bank products, such as credit cards, instead of integrating with an FI e.g. bank to avoid a potentially complex, and lengthy integration effort.

We designed our POC around a simple, easy-to-relate use case of an end-user applying for a credit card from a bank. In this scenario, there would be two groups of users:

Issuer - user issuing the VC, which is the bank in this scenario

Holder - user holding the VC, also known as the end-user



### **Overall Technical Architecture**

Our POC leveraged Trinsic's API to interact with the Sovrin blockchain directly. Using a custodial approach, VISH will orchestrate on behalf of the two groups of users and relieve them from interacting with the blockchain directly. This means VISH will issue VCs to the holders on behalf of the issuers issuing the VCs. VISH is also able to save the VCs on behalf of the holders in the background, so end-users need not manually save the issued VCs into their own wallets.



High level interaction diagram of the different systems involved in this POC

In our custodial approach, we require only one record of the entity, so only one decentralized identifier (DID) of VISH will be written into the chain as a NYM creation via Trinsic's APIs.



Example request for NYM type operation



To create a VC, we first need to define a schema which contains all the attributes to be contained within the VC to be issued. VISH will provide to Trinsic the attributes required for the VC that it will be issuing to create a SCHEMA operation in the blockchain.

Next, we define Claim definition (CLAIM\_DEF) which is used for both issuance and validation of VCs. It references the SCHEMA, DID of the issuer, and the public key of the issuer in the definition. This allows the issuer of VC to be verified as all issued VCs are signed with the issuer's private key.



Example request for SCHEMA type operation





We also define Revocation Registry Definition (REVOC\_REG\_DEF) which contains information such as accumulator and location of the tail file which will be used to check whether a VC has been revoked by the issuer since issuance. The accumulator is a cryptographic accumulator generated from the numbers from the tail file (referred as factors), which contains an array of randomly generated numbers. Removal of the factors within the tail file will result in value change of the accumulator as shown below.



Lastly, during revocation of VC, a Revocation Registry Entry (REV\_REG\_ENTRY) will be created in the chain and it will mark the status of the issued credential to be revoked and update the accumulator. Once the accumulator is updated, the revoked VC can no longer be verified.



Example request for REVOC\_REG\_DEF type operation



Example request for REVOC\_REG\_ENTRY type operation



### **Use Case Scenarios**

#### Scenario 1: Create Verifiable Credential (VC)



The Create Verifiable Credential (VC) process

To create VCs, VISH will need to gather the necessary information from the issuer.

- 1. VISH will determine the schema to create the VC.
- 2. Fill up personal information based on the schema, such as the name, address, and identity number.
- 3. Call Trinsic's create credential API to create the VC.



Detailed flow diagram for create Verifiable Credential (VC) process

In this POC, the issuer will provide the personal information that has gone through the "Know Your Customer" (KYC) process. From steps 1 to 2 in the diagram, the issuer will create the VC through VISH. In step 3, the VC created from Trinsic will have a unique credential ID to represent the VC, and the state of the VC will become "created."



#### Accept Verifiable Credential (VC)



Overview flow diagram for accept Verifiable Credential (VC) process

Since VISH adopts the custodian approach, it will save the VC on behalf of the users. The above figure shows the flow for saving the VC in the user's wallet:

- 1. VISH is required to obtain the user's wallet id from the database.
- 2. Add the previously created credential data.
- 3. Call Trinsic's API to save the credential data in the user's wallet.



Elaborated flow diagram for accept Verifiable Credential (VC) process

In the current POC, VISH will accept the VC for the user. Therefore, in step 3, the state of the VC will change to "issued." after saving the VC to the user's wallet.



#### Verify Verifiable Credential (VC)



For the scenario of the POC, when holder reuses his VC and sends it to apply for product. VISH will then verify the credential by first retrieving the VC from Trinsic and checking the state of the VC to ensure that it is in "Issued" state and not "Revoked". Afterwards the values of the retrieved VC will be compared against the VC that was sent by the holder to ensure that the VC has not been tampered with. The above flow was implemented instead of using the standard way of checking against the accumulator saved in the chain. As VISH is issuing VC on behalf of all its user, it is able to retrieve all the VCs that were issued via VISH, hence it will always have the source of truth to be check against with. This in term, simplify the whole verification process and cut down on processing time.



#### Revoke Verifiable Credential (VC)



Issuer of VISH can request to revoke a VC they previously issued by calling VISH revoke APIs with the credential id of the VC. Using the ID provided by the issuer, VISH will then retrieve the VC to be revoked from Trinsic and check that the VC is issued by the Issuer.

Once VISH confirmed that the VC is indeed issued by the Issuer, it will then proceed to call Trinsic API to revoke the issued VC. Trinsic will then write a Revocation Registry Entry ("REVOC\_REG\_ENTRY") to the Sovrin chain which will update the status of the VC to be "Revoked".



### **Project Outcomes and Findings**

According to a research report<sup>1</sup> published by Liminal Strategy Partners, the size of the reusable identity market is expected to grow from \$32.8 billion USD in 2022 to \$266.5 billion USD by 2027. There is a shift from transaction-based identity schemes to reusable identity ecosystems and reusable identity will continue to evolve as the next step to allow people FIs to create identity credentials that can be integrated across different use cases in the digital and physical world.

The traditional way of KYC process is problematic for FIs as it is cost intensive, time consuming and inconvenience for end users. It is also clear that KYC process needs to be more efficient and affordable with enhanced security and accuracy. With VISH, it can potentially help to eliminate the cost, time and potential inaccuracies of the manual KYC processes.

1. Cost per repeated KYC check

KYC fees can be prohibitively expensive<sup>2</sup> - A single KYC compliance check can cost between \$13 USD up to \$130 USD. In the traditional KYC process, each FI is required to conduct their customers' identity check and each individual is checked by an individual FI. As the premise of VISH operates based on trusting reusable digital identities, using VISH eliminates the need to perform repeated KYC checks on customers who have already been verified by an FI in the VISH network, thereby potentially reducing the amount of verification costs per repeated KYC checks<sup>3</sup> as the same person is no longer needed to be verified multiple times. For end users, it also helps to streamline onboarding processes as reusable digital identity can alleviate the need to constantly re-entering their personal info and ensuring their previous successful records do not go to waste. This will also reduce the risk when individuals input wrong data which will incur additional cost for new rounds of KYC.

2. Overall processing time

The traditional way of conducting KYC involves manual processing where FIs are required to send documents to 3<sup>rd</sup> party verifiers. These services are expensive and require long processing time. It is also time-consuming for individuals to take a picture of their ID every time when they apply new banking products. VISH allows end users to reuse verified KYC data and hence do not need to go through lengthy verification processes for subsequent applications. It allows individuals to re-use their previously submitted documents which could shorten their future verification process.

In our view, this can reduce inefficiencies and duplication of effort in KYC information gathering and time required to onboard new customers. This is one huge benefit to the customer experience.

3. Security

With the new and secure cryptographic capabilities, blockchain architecture and distributed ledger technology (DLT) allow us to collect info from various FIs into a single secure and unchanging database that does not need a 3<sup>rd</sup> party to verify the authenticity of the data. It

<sup>&</sup>lt;sup>3</sup> Not including the cost of manpower, price of compliance tools, additional KYC check with 3rd party vendor etc.)



<sup>&</sup>lt;sup>1</sup> Liminal Team, 2<sup>nd</sup> Mar 2022, '<u>The Market Opportunity for Reusable Identity and How to Get There'</u>

<sup>&</sup>lt;sup>2</sup> Bence Jendruszak, <u>'Cost of KYC: How much it is and how to reduce it'</u>

also provides a streamlined way to access clean, up-to-date customer data and hence it is possible to form a system where end users will only need to undergo the KYC process once to verify his/her identity.

4. Ease of implementation

We designed VISH platform in a manner that greatly simplified the process of using VCs. Instead of the usual manual and tedious process of tinkering with the low-level logic of network connectivity to allow exchange or transfer of VCs, and writing into the blockchain upon revocation of VC, it can be done in VISH via a few API calls. This also means that any third party that wishes to use VCs for their custom use case can simply re-use our VISH APIs since we have abstracted the key features of the VC such as issuance, verification, acceptance and revocation to a few simple API calls.

Singapore has been successfully in providing a series of trust services to citizens. SingPass was first introduced in 2003 to sign into government websites with username and password. And today SingPass includes new features including MyInfo, Digital IC, Verify etc.

MyInfo provides verified personal and corporate data and it is an independent source for the purpose of verifying customer's name, address, date of birth etc. Citizens may use SingPass app to sign up for government or private sector services by connecting to MyInfo, which allows for remote signing of documents. While SingPass allows its holders to access services with just one ID number, it also helps Singaporean businesses to onboard new clients and provide a secure environment for verification. SingPass does not require companies to request additional data such as proof of addresses. Currently, **97%** of Singapore Citizens and Permanent Residents aged 15 years old and above have SingPass accounts and there are over 3.2M SingPass app users and above 300 million personal and corporate SingPass transactions every year<sup>4</sup>. According to the **research** from GovTech<sup>5</sup>, banks reported an average decrease of up to 80% in application time for their customers and some seeing up to 15% higher approval rate due to MyInfo's better data quality.

Singapore has clearly empowered their citizens to transact digitally by offering them a convenient and secure digital identity and create an ecosystem of trust at the same time.

In order for VISH to be successful, VISH will need to build on the same success factors as SingPass, which involves creating a safe and trusted ecosystem that FIs and end users are willing to adopt and accept. While the POC validated the technical potential for reusable KYC through VCs, it also helps to address couple of issues faced by the financial industry today. The concept can potentially be expanded in the below scenarios:

1) Singapore

SingPass currently does not capture individual's financial info such as credit scoring, risk profiles etc. VISH can act as a supplementary tool to complement SingPass. These data will be validated by appropriate 3<sup>rd</sup> party sources and the results will be shared by and with FIs which will be recorded in the blockchain.

<sup>&</sup>lt;sup>5</sup> Govtech Singapore, 10<sup>th</sup> Nov 2017, <u>'Businesses can tap on MyInfo to offer faster transactions for citizens'</u>



<sup>&</sup>lt;sup>4</sup> Govtech Singapore, 28<sup>th</sup> Oct 2021, <u>'All Government Agencies to Accept Singpass Digital IC from 1 November 2021'</u>

#### 2) International

It is possible to share and reuse data cross border using the blockchain technology. The objective is to allow individuals to create a KYC profile and this profile can be created by the individuals themselves or by licensed entities (e.g. credit bureau, 3<sup>rd</sup> party service provider, FIs etc). This profile is interoperable in all cases where FIs want to conduct KYC. The profile will only be created once and the data will be updated every time the profile is used again.



### **Conclusion and Next Steps**

This whitepaper presents a vision of how we can reuse digital identities. We are helping to shape the world where KYC data can be shared across the network and trust can be easily established between the financial networks. VISH is a solution based on collaboration and it is the best model for managing digital interactions in future. Through our proof-of-concept, we allow trust to grow and to be shared. We have established that with the VISH model, the cost per repeated KYC check is reduced. Convenience is also one of the driving forces for reusable identity. The overall processing time can also be reduced significantly as we have removed the need for the end users to constantly re-entering their personal info. It also ensures that the identity is stored and shared in a way that is safe. With that, end users will feel confident when submitting their personal data to VISH.

VISH a secure solution on reusing KYC data between FIs. Based on the findings, we have found that reusing KYC data using blockchain is a technology viable solution which provides a method safely and securely share verified data between parties. A blockchain-based solution allows FIs to have the confidence to trust the information, knowing that it cannot be changed and altered. Instead of end users having to prove identity many times by going through multiple KYC processes, they just need to do once and that secure, verified identity can be re-used by other FIs. Blockchain also makes transactions more secure, more transparent and it provides full visibility on who and when the information was entered.

According to McKinsey<sup>6</sup>, nearly 1 billion people globally currently lack a legally recognized form of identification resulting in limited or no access to financial services or even registering a business. Cumbersome identification procedures, lack of access and unable to identify of personal identity are the major barriers that keep individuals outside of the traditional financial services. Some form of digital identity can help the rest of the world's inhabitants who either have some form of ID but have limited access to online services, or those who are active online but struggle to keep track of their digital footprint securely and efficiently. The importance of digital identity has grown exponentially as we are now highly reliant on the internet for our daily activities. With the implementation of digital identity, it will help to unlock a range of essential services and will even lead to growth and a more inclusive economy.

This concept has also been presented to lecturers from Temasek Polytechnic's School of ICT and showcased at a March 2023 TP InfoTech Day where visitors get to experience the innovations developed and undertaken in collaborations with industry partners and various government agencies employing the latest technologies. The idea of reusable identities generated interest from both the educational institution and various industry partners. We believe VISH can provide a unique opportunity to build an open and scalable ecosystem which can improve customer onboarding experience and digital identity will certainly open opportunities for new products and business models.

<sup>&</sup>lt;sup>6</sup> McKinsey Global Institude, 17<sup>th</sup> Apr 2019, <u>'Digital identification: A key to inclusive growth'</u>



### **Project Participants**

### About PayPal

PayPal has remained at the forefront of the digital payment revolution for more than 20 years. By leveraging technology to make financial services and commerce more convenient, affordable, and secure, the PayPal platform is empowering millions of people and businesses across the globe through over 430 million active accounts in more than 200 markets to join and thrive in the global economy.

Company website: www.paypal.com

### **Project Team**

Name	Role
Joanna Koh	Program Manager
Anthony Cheung	Product Manager
Tan Kok Wee	Solution Architect
Chu Ying Yu	Solution Architect
Chua Yu Hui	Solution Architect (Intern)

If you have any enquiries or would like to collaborate, please reach out to us at PayPalInnovationLab@paypal.com



### Appendix

### End User Activity Diagram (Detailed View)





### End User Application Flow (High level view)



- 1. Before Product Application, users will be prompted to log in.
- 2. Users with no Verifiable Credential (VC) will need to manually fill in the Application form.
- 3. Existing users with a VC will have their application form automatically filled up. Alternatively, Users may edit their VC information and thereafter, user VC will need to be re-verified.
- 4. If a user has previously applied for a product, they will not be able to re-apply for the same product.
- 5. On successful submission of application, user will be redirected to "My Applications" page to view their newly submitted applications.



### FI Activity Diagram (Detailed View)



### FI Application Review Flow (High level view)



- 1. Upon Log In, FI will land in Admin Page View.
- 2. FI will be able to Toggle their products between "Active" and "Inactive" state.
  - a. FI will not be able to edit or delete "Active" state products.
  - b. FI will be able to edit or delete "Inactive" state products.
- 3. FI will be able to "Approve" or "Reject" user applications for their products.
- 4. VC status will be updated to "Verified" for all "Approved" applications.
- 5. VC status will be updated to "Rejected" for all "Rejected" applications.



### Our marketplace solution

### Admin screen (product management)





#### Admin screen (application management)



#### Admin pending application screen

### Admin approve/reject application

#### Admin approved application screen



=	VISH			
	t.	USER APPLICATIONS Rejected		
	Ref. No.	Product	Status	
<b>В</b> АРРНОVED	REF-4ZAVIN4WNC8I1	Sky Bank Miles Card	Rejected	
A REJECTED	REF-YF4GW08IKK3W	Sky Bank Miles Card	Rejected	
	REF-OKAS14630H54	Sky Bank Milos Card	Rejected	
	REF-CWUBUWSSX1L	Sky Bank Miles Card	Rejected	
	REF-RNJCSRXSEJ	Sky Bank Miles Cand	Rejected	

Admin rejected application screen

### End user screen (apply for product)

VISH	
Paradise Bank Compared Start Card Apply Paradise Bank Rewards Card Apply Paradise Bank offers you 10X Rewards Points per S\$1 spent in foreign currency, including online spends.	
Sky Bank Miles Card Apply           Sky Bank Miles Card         Sky Miles never expire so you can accumulate them over time.	User home screen
E VISH testaccount	
Sky Bank VISA	
Personal Details	
a12345678i	
test name	
Mobie No."	User applies for product
End*	
testmail@mail.com	
Addess*	
wst appress	
Submit	
Cancel	



=				
	MY APPLICATIONS Panding			
A PENDING	Reference No.	Product	Status	
	REF-98R0C80JGZKN	Sky Bank Miles Card	Pending	
=		VISH	testaccount	
MY APPLICATIONS				
	Reference No.	Approved Product	Status	
	REF-98R0C80JGZKN	Sky Bank Mites Card	Approved	
REJECTED				

## User product application status

### End user screen (apply for new product with verified credential)

=			testaccount1	
Paradise Bank	Paradise Bank Rewards Card Paradise Bank offers you 10X Rewards Points per S\$1 spent in foreign currency, including online spends.	•	Apply	
Sky Bank         VISA           1000         2295         6000         2490           1000         2005         6000         2490           1000         1000         1000         2490	Sky Blank Miles Card Sky Miles never expire so you can accumulate them over time.	•	Apply	
	VISH		testaccount1	User apply for product
	APPLICATION			screen with vermed
	Paradise Bank Distance State			
	NRIC* \$12345678i	~		
	Name* test name	7		
	Mobile No. * 12345678	~		
	Email * testmail⊛mail.com	1		
	Address* test address	~		
	Submit			
	Cancel			



