



Span Software

# **SpanKey™ & SpanKey/SE™**

Cryptographic Key Management System  
EMV Chip Card Key Management System  
PIN Processing System

[www.spansoftware.com](http://www.spansoftware.com)

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# SpanKey

## Topics

- Introduction
- Overview
- Span Software
- SpanKey Features
- Future direction
- Discussion
- Live Demonstration



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# SpanKey

## Product Components

- DES Key Management System
- RSA Key Management System
- EMV Key Management System
- EMV Card Data Generation System
- Debit and Credit card PIN Processing
- High-performance Application Programming Interfaces for all cryptographic functions
- High-performance Application Programming Interfaces for all EMV functions



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# SpanKey

Mainframe-based commercial-quality software product  
by Span Software Consultants Limited

- Pure System z product (z/OS)
- High performance
- High reliability
- High availability
- Security via RACF
- All Crypto performed in internal IBM hardware via ICSF with PCIXCC or CEX2C
- Installation and maintenance via SMP/E

# or... **SpanKey/SE**



Span Software

Mainframe-based commercial-quality software product  
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- Pure System z product (z/OS)
- High performance
- High reliability
- High availability
- Security via RACF
- Crypto in software - no hardware needed
- Installation and maintenance via SMP/E



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# SpanKey

Mainframe-based commercial-quality software product

- All cryptographic keys are generated, stored and managed on the mainframe – keys and customer data never need leave the z/OS environment
- All SpanKey software is written in assembler for maximum performance and compatibility with all environments
- All cryptographic processing uses IBM hardware internal to the CPU
- No assumptions made about customer applications - SpanKey does not require any external database software and retrieves its data with typical access times of well under a millisecond (including RACF checks)
- SpanKey works within customers' existing standards for data backup, naming conventions, access control, etc
- SpanKey is designed for 100% system availability



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# Span Software Consultants Limited

## Profile

- Suppliers of consultancy services and MVS system software
- Established in 1976
- More than 30 years of experience in developing and supporting MVS software products



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# Span Software Consultants

## Commercial software products

- ▶ **SPANEX** program and job execution services, development tools
  - Job scheduling and automatic job restart
  - Many development and run-time execution tools
- ▶ **SPICE/DLI** automated restart and recovery for database applications
  - IMS version of well-established program development and automatic restart tool
  - Used by major corporations world-wide
- ▶ **SPICE/SQL** automated restart and recovery for database applications
  - DB2 version of program automatic restart tool
  - Used world-wide by major corporations and banks
- ▶ **BEARS/IMS** IMS performance and usage monitor
  - Performance measurement for the largest IMS systems
  - Also used for cross-charging of IMS transactions



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# SpanKey Features

Hardware and Software Requirements for SpanKey

- IBM System z processor
- At least one cryptographic co-processor
- zSeries z890, z990, System z9, z10 or z196 requires PCIXCC or Crypto Express crypto adapter, as appropriate
- Triple-DES feature
- z/OS
- ICSF
- RACF or equivalent



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# SpanKey Features

Hardware and Software Requirements for SpanKey/SE

- Any IBM, IBM-compatible or emulated mainframe processor
- z/OS
- RACF or equivalent



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# SpanKey Features

## Facilities Provided

- Key and Certificate database
- MVS Data Space provides instantaneous access to keys, RSA Certificates, PIN tables, etc
- RSA Key Generation and Management
- Data interchange with VISA and MasterCard
- High-performance Run-time APIs for all crypto, PIN and EMV functions
- Provides all functions for card issuing and transaction processing
- Automatic creation of EMV card production data
- Dataset encryption utility



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# SpanKey Features

## EMV Features

- Installs and stores Card Scheme public keys
- Generates issuer RSA keys, ICC and PIN Encipherment RSA keys
- Formats self-signed public key files for Card Schemes
- Formats hash files for Card Schemes
- Cryptographically verifies public key certificates signed by Card Schemes
- Installs and stores issuer certificates
- Provides application interfaces to cryptographic functions
- Creates EMV card production data from input file (database extract or magnetic stripe data) and user-specified parameters
- Infinitely scalable
- Supports all environments (eg batch, TSO, IMS, IMSFP, CICS)



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# SpanKey Features

## Other Features - 1

- DES and RSA Key Management System
  - ▶ Generates and stores DES keys and definitions
  - ▶ Generates DES key components
  - ▶ Installs DES keys in ICSF CKDS
  - ▶ Supports multiple MVS systems and CKDSs
  - ▶ Generates and manages RSA keys and certificates
  - ▶ Exports keys for other systems
  - ▶ Imports keys from other systems
  - ▶ Imports keys in component form (dual-control supported)
  - ▶ Imports existing DES keys from CKDS
- Stores and delivers user-defined data
- Comprehensive reporting facilities
- Database export/import facilities
- Re-encrypt facility for database contents



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# SpanKey Features

## Other Features - 2

- PIN Processing
  - ▶ Random customer PIN generation in hardware
  - ▶ PINs and offset values derived from account and other data
  - ▶ PVVs generated and verified
  - ▶ PINs never revealed in clear
  - ▶ Supports PIN lengths from 4 to 12 digits
  - ▶ Supports PIN encryption with DUKPT key
- PIN Exclusion table (for random PINs)
  - ▶ Generated offline, loaded into SpanKey Data Space
  - ▶ Contains undesirable customer PIN values (eg 1234, 9999)
  - ▶ Can include “wild card” characters
  - ▶ Accessed at run-time to eliminate easily guessed PINs
  - ▶ Additional card-specific PINs can be excluded at run-time
  - ▶ Can be used to reject customer-selected PINs
  - ▶ All processing performed on encrypted PIN values



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# SpanKey Features

## Other Features - 3

- ISPF/TSO Panel-driven user interface
  - ▶ Very easy to use and to understand
  - ▶ Minimal training required for users
  - ▶ All standard key management functions can be performed interactively
  - ▶ Results of actions can be displayed immediately
  - ▶ Key changes can be applied to the system instantly
  - ▶ Full RACF control of user functions
  - ▶ Full interactive Help system
  - ▶ Interactive testing and demonstration facilities for many SpanKey APIs



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# SpanKey Features

## Primary Option Menu Screen-shot

----- SpanKey Cryptographic Key Management System -----

Command ==>

Select option from the list below:

- 1 Define new SpanKey key or resource
- 2 Delete existing SpanKey key or resource
- 3 Generate a cryptographic key or DES key PIN table
- 4 Validate an EMV RSA key
- 5 Install Certification Authority Public Key
- 6 Import commands
- 7 Export commands
- 8 Report SpanKey resources
- 9 Test SpanKey Application Programming Interfaces
  
- M More SpanKey facilities
  
- X Exit SpanKey menu

Specify SpanKey Database name:

SPANKEY.DATABASE

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# SpanKey Features

## Application Program Interfaces - 1

- Card Verification Value (CVV, CVC) Calculations
- Card Security Code (AmEx CSC) Calculations
- Triple DES Encryption and ARPC
- Triple DES Message Authentication and ARQC
- Secure Hash Algorithms
- Read data from SpanKey Data Space (eg RSA Certificates, User data, PIN Exclusion tables, etc)



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# SpanKey Features

## Application Program Interfaces - 2

- PIN processing:
  - ▶ Generate random PIN
  - ▶ Derive PIN from account and other data
  - ▶ Calculate PIN offset for customer-selected PIN
  - ▶ Verify PIN from account, offset and other data
  - ▶ Select PIN from PIN List
  - ▶ Validate customer-selected PIN against PIN Exclusion List
  - ▶ PIN block translate or reformat
  - ▶ Generate PVV
  - ▶ Verify PVV



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# SpanKey Features

## Application Program Interfaces - 3

- EMV API facilities:
  - ▶ Generate Digital Signature
  - ▶ Verify Digital Signature
  - ▶ Generate EMV Card Keys
  - ▶ Create EMV Unique Derived Key (UDK)
  - ▶ Create EMV Tag Element
  - ▶ Create VISA session key for card script processing
  - ▶ Create MasterCard session key for card script processing
  - ▶ Generate script cryptogram for VISA PIN change
  - ▶ Generate script cryptogram for MasterCard PIN change
  - ▶ Generate script cryptogram for EMV2000 PIN change
  - ▶ Generate DDA data (ICC RSA key and certificate, ICC PIN Encipherment key and certificate)
- Ultra-high speed RSA key generation/delivery (eg for DDA)
- Character conversions



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# SpanKey Features

## API Testing Menu Screen-shot

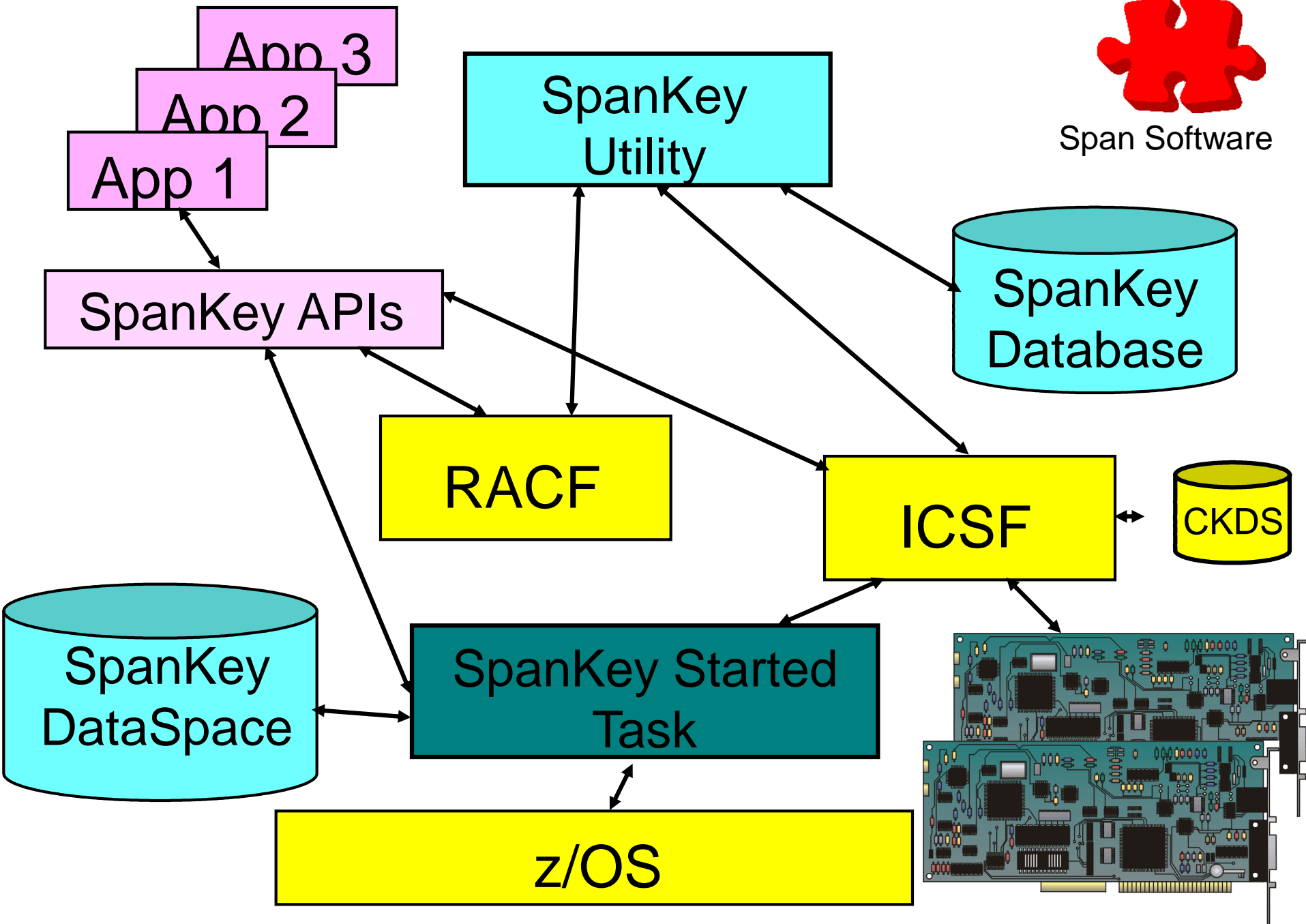
```
----- SpanKey Cryptographic Key Management System -----  
----- Test SpanKey Application Programming Interfaces -----  
Command ==>
```

Select option from the list below:

- 0 Test SPCACDRD API (Read data from SpanKey Data Space)
- 1 Test SPCACCSC API (American Express Card Security Codes)
- 2 Test SPCACCVV API (VISA and MasterCard Verification Values)
- 3 Test SPCACDDG API (DDA Data Generation)
- 4 Test SPCACDES API (DES Encryption and Decryption, and ARPC)
- 5 Test SPCACDPN API (Generate Derived PIN)
- 6 Test SPCACDPN API (Generate PIN Verification Value)
- 7 Test SPCACEMV API (EMV Tag Creation)
- 8 Test SPCACFRG API (Fast RSA Key Generation)
- 9 Test SPCACGWK API (Generate Working DES Key)
- 10 Test SPCACMAC API (Triple DES MAC and ARQC)
- 11 Test SPCACSPL API (Select PIN from List)
- 12 Test SPCACSSR API (Special Script functions)
- 13 Test SPCACUDK API (Unique Derived Key)
- 14 Test SPCACVSK API (VISA or MasterCard Session Key)
  
- X Return to SpanKey Primary Option Menu



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# SpanKey

## Sample Commands

(Commands can also be performed interactively)

To create a VISA Master Derivation Key:

```
GENERATE DESKEY NAME (FRED) MDK
```

To add all DES keys to a new MVS system:

```
GENERATE DESKEY APPLY NAME (ALL)
```

To create a PIN Exclusion Table:

```
GENERATE PINTABLE NAME (BERT)  
TYPE (STANDARD 7283 911*)
```



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# SpanKey/SE

## Further Information

- SpanKey/SE has all the functionality of SpanKey, but does not use ICSF or its CKDS
  - ▶ Encrypted keys are stored in the SpanKey/SE database
  - ▶ Keys can be transferred between products using Import/Export features
- Other security and Access Control is as for SpanKey
- Optional ICSF Emulation for use of ICSF APIs
- SpanKey/SE is ideal for:
  - ▶ Evaluating the SpanKey product range
  - ▶ Evaluating the use of the mainframe
  - ▶ Application development and testing
  - ▶ Minimising hardware costs



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# EMV Card Data Generation

- Automatic generation of EMV chip card data
  - Input: Magnetic-stripe card production file
  - or
  - Input: Customer/cardholder database extract file containing relevant details – any file format
  - Output: EMV chip card production file
  - No Application Programming required
  - Completely flexible EMV tag and data creation
  - Pure z/OS mainframe implementation
  - Very fast!

# SpanKey

Questions and Discussion



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# New features

New features in the current Version 3.1 of SpanKey include the following:

- Comprehensive automatic EMV Card Data Generation utility. Conversion of magnetic stripe data or database extract files into EMV card production data. Creation of EMV Tag and DGI data elements.
- Automatically add new data to existing EMV card production files (eg convert from SDA to DDA).
- New SPCACEMV API for creating EMV Tag elements in application programs.
- New support for DUKPT PIN block encryption in SpanKey PIN APIs
- New “MACK” option for DES key generation simplifies creation of Message Authentication Code keys.
- API support for SHA-256 hashing algorithm.
- Support for dual-control of DES key components
- Support for RSA keys up to 4096 bits
- Various improvements and extensions to the TSO/ISPF panel user interface.