SIA OSDP for Deployment Teams

April 2017

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Introduction to SIA OSDP

- Introduction to badge technologies for physical and logical access
- Credential data formats and technology
- Iso stack, layer 1
- Data structures
- Protocols
- IoT Considerations
- Protocols and standards

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TIA/EIA-485-A (a/k/a RS-485) Signalling challenge

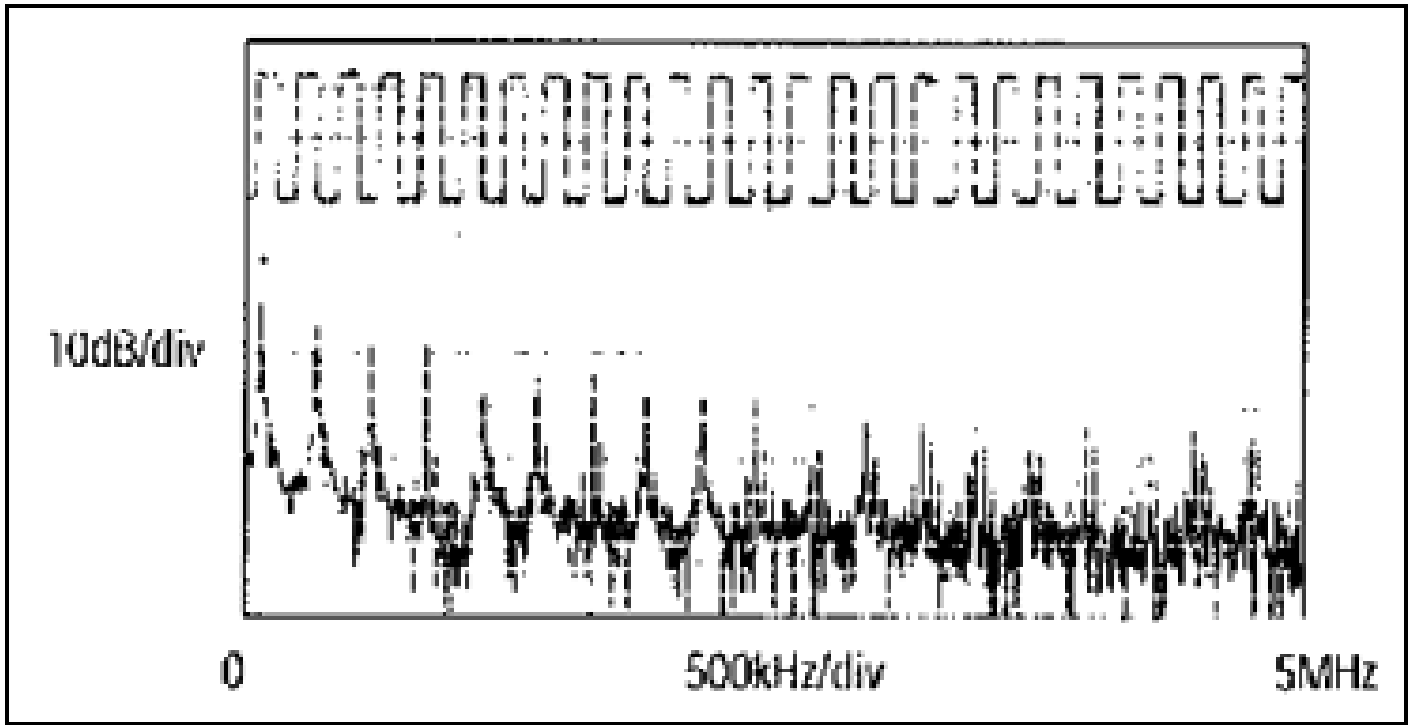

Figure 3. Waveform of a 125kHz square wave and its FFT plot.

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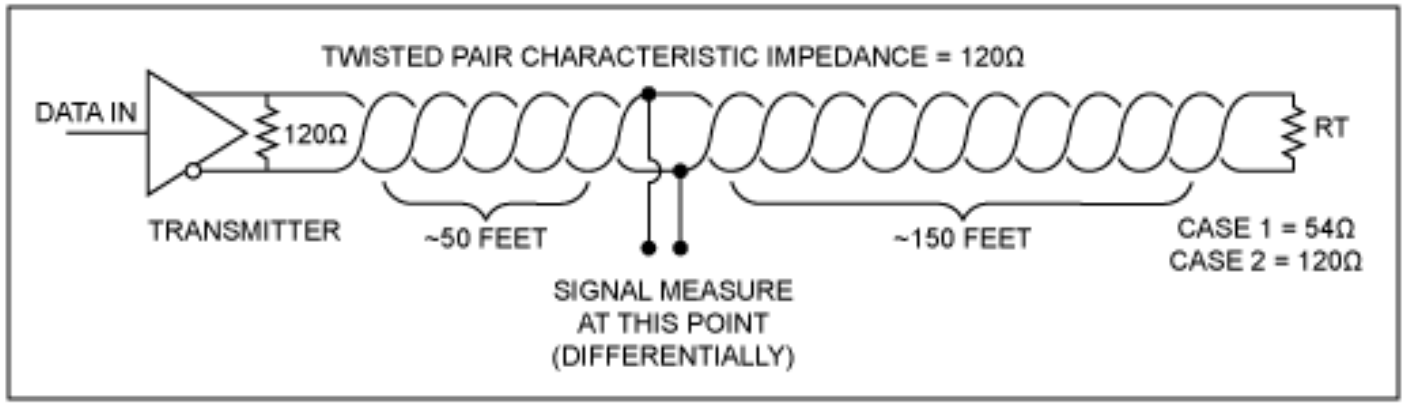
TIA/EIA-485-A (a/k/a RS-485) Terminated Twisted Pair



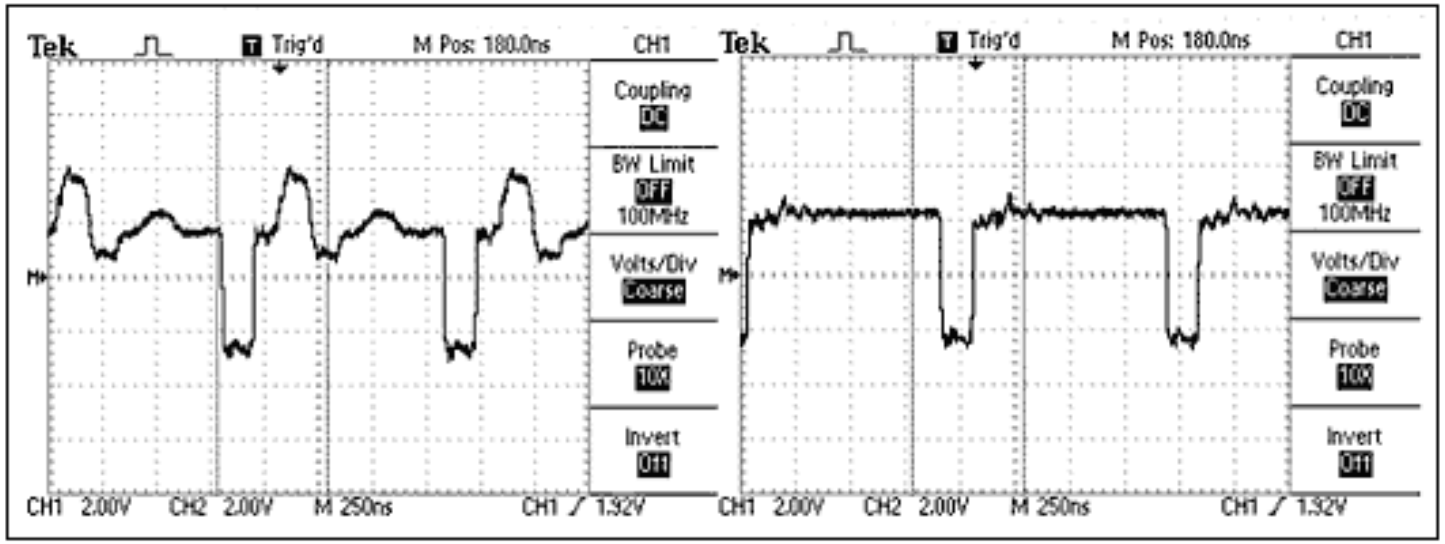


Figure 5. Using the circuit shown at the top, the waveform on the left was

SIA OSDP Use Cases

- Stock old school 26 bit wiegand
- Output signaling
- Input signaling
- Bidirectional credentials communications
- Secure card communications
- Standardized reader interface

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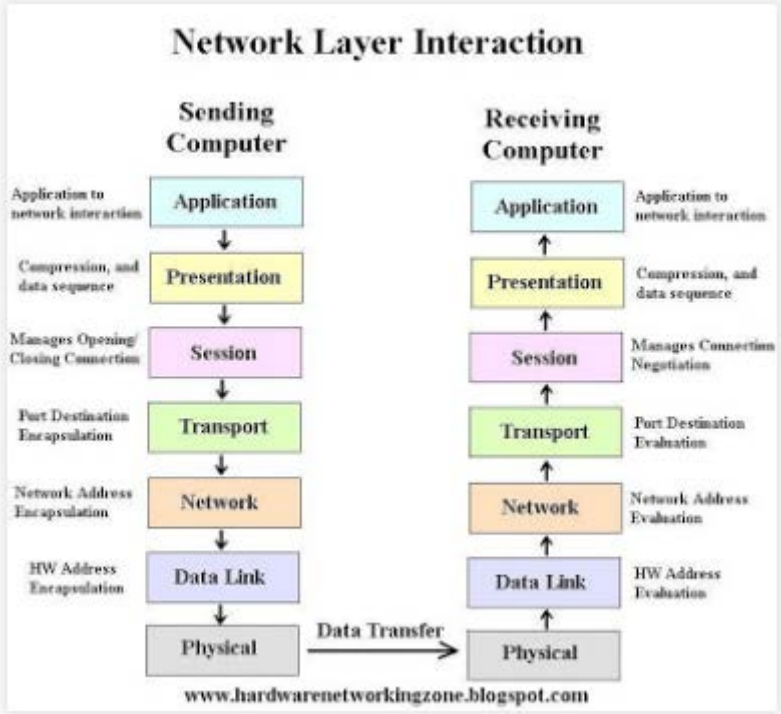
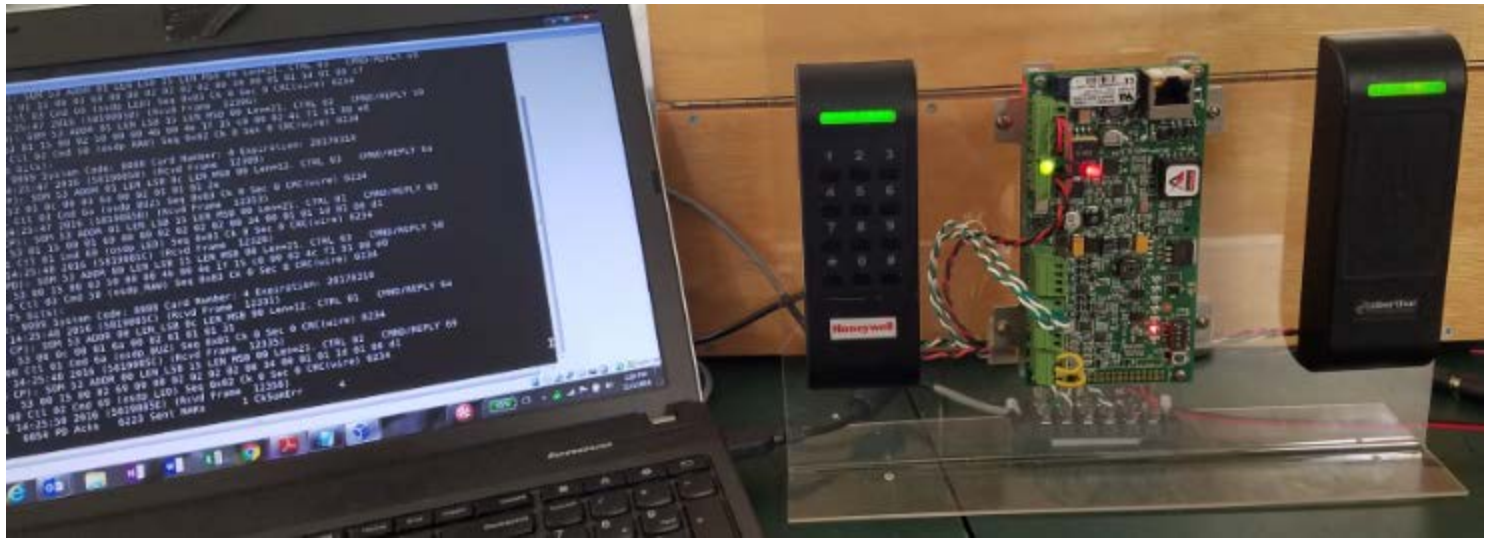
OSDP: Data Link Layer (Layer 2) protocol



Meanwhile, at Layer 2



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SIA OSDP Protocol

There are computers in the card readers and the panels.

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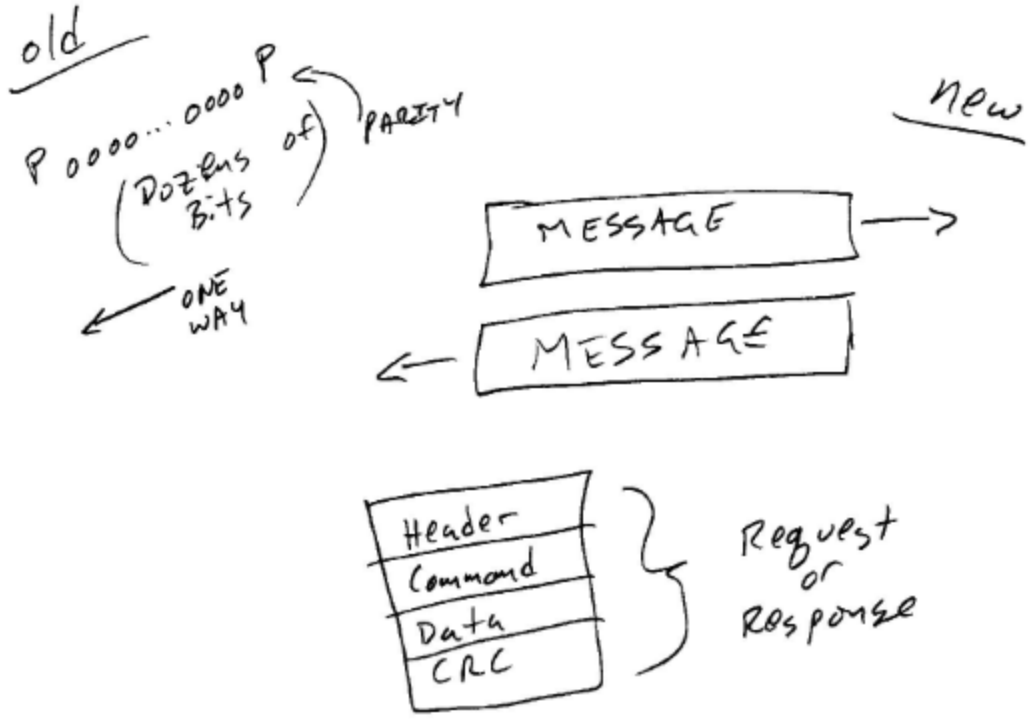
OSDP: A Computer to Computer Protocol



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Communications Protocol

- Document specification of message format.
- Error correction.
- message sequencing.
- acknowledgements (positive and negative.)
- Message addressing.
- Intended for public distribution.
- Meant for interoperable use.
- Implemented by multiple vendors.

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It's a *Standard*

- ANSI-accredited organization
- ANSI-track document standards process
- Not vendor-specific
- Not patent encumbered
- At least three genetically separate implementations exist
- Open source implementation available

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It's a *Thing* thing

- Intended for constrained computing platforms.
- Used in infrastructure.
- Protocol purpose-built with limited functionality.
- Works in environments too constrained for conventional (TCP/IP) networking.
- Roughly equivalent to MQTT or other low-end control protocols.
- Like an IoT thing but created in the 1990's.

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Published Standard

Open Supervised Device Protocol (OSDP)
Version 2.1.7

Communication Protocol for Peripheral Devices with Data Security Extension

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OSDP Concepts

- Taxonomy: CP and PD
- PD's can be Peripheral (minimal), Basic, Biometrics, Extended Packet Mode
- 2-wire RS-485 (TLS version proposed)

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OSDP Dialog

- 2-way, acknowledged, with multipart-messaging available.
- Read credentials
- Interact with credentials
- Receive input signaling (alarm points.)
- Send output signaling (relay output.)

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OSDP Profiles

- Peripheral – minimal device
- Basic – classic card reader (sends OSDP_RAW)
- Biometrics – supports appropriately implemented classic fingerprint-based biometric match solutions
- Credential processing – Extended Packet Mode to interact with intelligent (phone, smart card) credentials.

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OSDP Messages

- Poll, Ack, and Nak
- Raw Data
- Ident
- Capabilities
- Input change: Tamper, signal in, power
- Output: LED, signal out

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OSDP Message Format

Byte	Name	Meaning	Value
0	SOM	Start of Message	0x53
1	ADDR	Physical Address of the PD	0x00 – 0x7E 0x7F = configuration
2	LEN_LSB	Packet Length Least Significant Byte	Any
3	LEN_MSB	Packet Length Most Significant Byte	Any
4	CTRL	Message Control Information	See List
	SEC_BLK_LEN	(optional) Length of Security Control Block	Any
	SEC_BLK_TYPE	(optional) Security Block Type	See List
	SEC_BLK_DATA	(optional) Security Block Data	Based on type
	CMND/REPLY	Command or Reply Code	See List
	DATA	(optional) Data Block	Based on CMD/REPLY
	MAC [0]	(optional) Present for secured messages, dependent on SEC_BLK_TYPE; (see Appendix D)	
	MAC [1]	"	
	MAC [2]	"	
	MAC [3]	"	
	CKSUM/CRC_LSB	Checksum, or, CRC-16 Least Significant Byte	
	CRC_MSB	(optional) CRC-16 Most Significant Byte	

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Command Messages

Commands

Name	Value	Meaning	Data
osdp_POLL	0x60	Poll	None
osdp_ID	0x61	ID Report Request	Id type
osdp_CAP	0x62	PD Capabilities Request	Reply type
osdp_DIAG	0x63	Diagnostic Function Command	Request code
osdp_LSTAT	0x64	Local Status Report Request	None
osdp_ISTAT	0x65	Input Status Report Request	None
osdp_OSTAT	0x66	Output Status Report Request	None
osdp_RSTAT	0x67	Reader Status Report Request	None
osdp_OUT	0x68	Output Control Command	Output settings
osdp_LED	0x69	Reader Led Control Command	LED settings
osdp_BUZ	0x6A	Reader Buzzer Control Command	Buzzer settings
osdp_TEXT	0x6B	Text Output Command	Text settings
osdp_RMODE	0x6C	... removed ...	
osdp_TDSET	0x6D	Time and Date Command	Time and Date
osdp_COMSET	0x6E	PD Communication Configuration Command	Com settings
osdp_DATA	0x6F	Data Transfer Command	Raw Data
osdp_XMIT	0x70	... removed ...	
osdp_PROMPT	0x71	Set Automatic Reader Prompt Strings	Message string
osdp_SPE	0x72	... removed ...	
osdp_BIOREAD	0x73	Scan and Send Biometric Data	Requested Return Format
osdp_BIOMATCH	0x74	Scan and Match Biometric Template	Biometric Template
osdp_KEYSET	0x75	Encryption Key Set Command	Encryption Key
osdp_CHLNG	0x76	Challenge and Secure Session Initialization Rq.	Challenge Data
osdp_SCRYPT	0x77	Server Cryptogram	Encryption Data
osdp_CONT	0x79	... removed ...	
osdp_MFG	0x80	Manufacturer Specific Command	Any
	A0-EF	Reserved for Application Specific Messages	
osdp_SCDONE	0xA0	... removed ...	
osdp_XWR	0xA1	See Application Specific Messages	Defined in ASM Document
osdp_ABORT	0x7A	Stop Multi Part Message	None
osdp_MAXREPLY	0x7B	Maximum Acceptable Reply Size	

Reply Messages

Replies

Name	Value	Meaning	Data
osdp_ACK	0x40	Command accepted, nothing else to report	None
osdp_NAK	0x41	Command not processed	Reason for rejecting command
osdp_PDID	0x45	PD ID Report	Report data
osdp_PDCAP	0x46	PD Capabilities Report	Report data
osdp_LSTATR	0x48	Local Status Report	Report data
osdp_ISTATR	0x49	Input Status Report	Report data
osdp_OSTATR	0x4A	Output Status Report	Report data
osdp_RSTATR	0x4B	Reader Status Report	Report data
osdp_RAW	0x50	Reader Data – Raw bit image of card data	Card data
osdp_FMT	0x51	Reader Data – Formatted character stream	Card data
osdp_PRES	0x52	... removed ...	
osdp_KEYPPAD	0x53	Keypad Data	Keypad data
osdp_COM	0x54	PD Communications Configuration Report	Comm data
osdp_SCREP	0x55	... removed ...	
osdp_SPER	0x56	... removed ...	
osdp_BIOREADR	0x57	Biometric Data	Biometric data
osdp_BIOMATCHR	0x58	Biometric Match Result	Result
osdp_CCRYPT	0x76	Client's ID, Random Number, and Cryptogram	Encryption Data
osdp_RMAC_I	0x78	Initial R-MAC	Encryption Data
osdp_MFGREP	0x90	Manufacturer Specific Reply	Any
osdp_BUSY	0x79	PD is Busy reply	
osdp_XRD	0xB1	See Application Specific Messages	Defined in ASM Document
~~osdp_XRD~~	~~0xB1~~	~~See appendix~~	~~Defined in Appendix E~~

Poll and Ack

Message: osdp_POLL Addr:00 Lth:8. CTRL 05 Cmd 60 Seq:01 Sec 0 CRC 99da(4)

OSDP PD Frame-in:0007 Timestamp:20160824-104931 (Sec/Nanosec: 1474739371 57347661)

Raw: 53 80 08 00 05 40 68 9f

Message: osdp_ACK Addr:00 Lth:8. CTRL 05 Cmd 40 Seq:01 Sec 0 CRC 9f68(4)

OSDP CP Frame-in:0008 Timestamp:20160824-104935 (Sec/Nanosec: 1474739375 75618128)

Raw: 53 00 08 00 06 60 89 cc

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OSDP Basic Profile

✓ = REQUIRED TO CONFORM TO PROFILE		Basic Reader
Communication Settings		
2.1	Physical Interface	✓
2.2	Signaling	✓
2.3	Character Encoding	✓
2.4	Channel Access	✓
2.5	Multi-byte Data Encoding	✓
2.6	Packet Size Limits	✓
2.7	Timing	✓
2.8	Message Synchronization	✓
2.9	Packet Format	✓
2.10	SOM – Start of Message	✓
2.11	ADDR – Address	✓
2.12	LEN – Length	✓
2.13	CTRL - Control	✓
2.14	Security Block	✓
2.15	CMND/REPLY - Command/Reply Code	✓
2.16	CHKSUM/CRC16 - Message Check Codes	✓
2.17	Messages Supporting the Transfer of Large Data Arrays	
Commands		
3.1	Poll (osdp_POLL)	✓
3.2	ID Report Request (osdp_ID)	✓
3.3	Peripheral Device Capabilities Request (osdp_CAP)	✓
3.4	Diagnostic Function Request (osdp_DIAG)	✓
3.5	Local Status Report Request (osdp_LSTAT)	✓

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OSDP Basic Profile (cont.)

3.6	Input Status Report Request (osdp_ISTAT)	✓
3.7	Output Status Report Request (osdp_OSTAT)	✓
3.8	Reader Status Report Request (osdp_RSTAT)	✓
3.9	Output Control Command (osdp_OUT)	✓
3.10	Reader LED Control Command (osdp_LED)	
3.11	Reader Buzzer Control Command (osdp_BUZ)	
3.12	Reader Text Output Command (osdp_TEXT)	
3.14	Communication Configuration Command (osdp_COMSET)	
3.16	Set Automatic Reader Prompt Strings (osdp_PROMPT) *DRAFT*	
3.17	Scan and Send Biometric Template (osdp_BIOREAD)	
3.18	Scan and Match Biometric Template (osdp_BIOMATCH)	
3.19	Continue Multi-Part Message (osdp_CONT)	
3.20	Manufacturer Specific Command (osdp_MFG)	
3.21	Manufacturer Specific Command (osdp_MFG) NEW	
3.22	Stop Multi Part Message (osdp_ABORT)	
3.23	Maximum Acceptable Reply Size (osdp_MAXREPLY)	
Replies		
4.1	General Acknowledge, Nothing to Report (osdp_ACK)	✓
4.2	Negative Acknowledge – SIO Comm Handler Error Response (osdp_NAK)	✓
4.3	Device Identification Report (osdp_PDID)	✓
4.4	Device Capabilities Report (osdp_PDCAP)	✓
4.5	Local Status Report (osdp_LSTATR)	✓
4.6	Input Status Report (osdp_ISTATR)	✓
4.7	Output Status Report (osdp_OSTATR)	✓
4.8	Reader Tamper Status Report (osdp_RSTATR)	✓
4.9	Card Data Report, Raw Bit Array (osdp_RAW)	
4.10	Card Data Report, Character Array (osdp_FMT)	
4.11	Keypad Data Report (osdp_KEYPAD)	
4.12	Communication Configuration Report (osdp_COM)	
4.13	Scan and Send Biometric data (osdp_BIOREADR)	
4.14	Scan and Match Biometric Template (osdp_BIOMATCHR)	
4.15	Manufacturer Specific Reply (osdp_MFGREP)	
4.16	Manufacturer Specific Reply (osdp_MFGREP) NEW	
4.17	PD Busy Reply (osdp_BUSY)	

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Deployment, Maintenance, and Troubleshooting

Hang it on the wall, keep it on the wall, fix it when it falls off the wall.

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Deployment Considerations

- Specification
- Credential Configuration
- Components: readers, mounting tools, config tools, cabling, documentation, configuration specs
- Credential, PACS, and CP preparation
- PD staging
- OSDP CP configuration
- OSDP PD configuration

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OSDP Deployment Check-list

- CP asset management (firmware, documentation)
- CP configuration
- Wiring, line speed, line termination, wiring topology (CP and PD)
- PD configuration
- PD asset management (firmware, documentation)
- Key management
- Installation meets specs
- Calibration

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Disposal

- Zeroize the keys
- Reset to factory default (which should zeroized the keys)
- External marking and identity scrub

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Maintenance

- Reader environment
- Cabling
- Firmware updates (CP and PD)
- Key management
- Wear and tear (and vandals and hackers)
- Credential stability and evolution

Troubleshooting

- Configuration
- Telemetry
- Re-calibration
- Updates
- Diagnostic analysis

Tracing and Diagnostics

- RS-485 data trace
- Diagnostic tools
- 3-rd party OSDP tools (libosdp, others)
- Device statistics and logs
- Protocol troubleshooting

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Thank you!

Be safe out there.

References

- http://hardwarenetworkingzone.blogspot.com/2013/06/osi-model-concept.html
- https://www.maximintegrated.com/en/app-notes/index.mvp/id/763

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About Smithee…

- Consultancy based in northern California.
- Focus on network integration and security issues for physical security and infrastructure operators.
- Delivers consulting, training, technical evaluation services.
- The name comes from standardized anonymous names used for authors in the theatre world.

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