RIST Advanced Profile

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Agenda

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- Quick Review of RIST Simple and Main Profiles
- Benefits of the Advanced Profile
- Overview of RIST Advanced Profile Features
- Future Directions

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RIST Simple and Main Profiles

RIST Milestones

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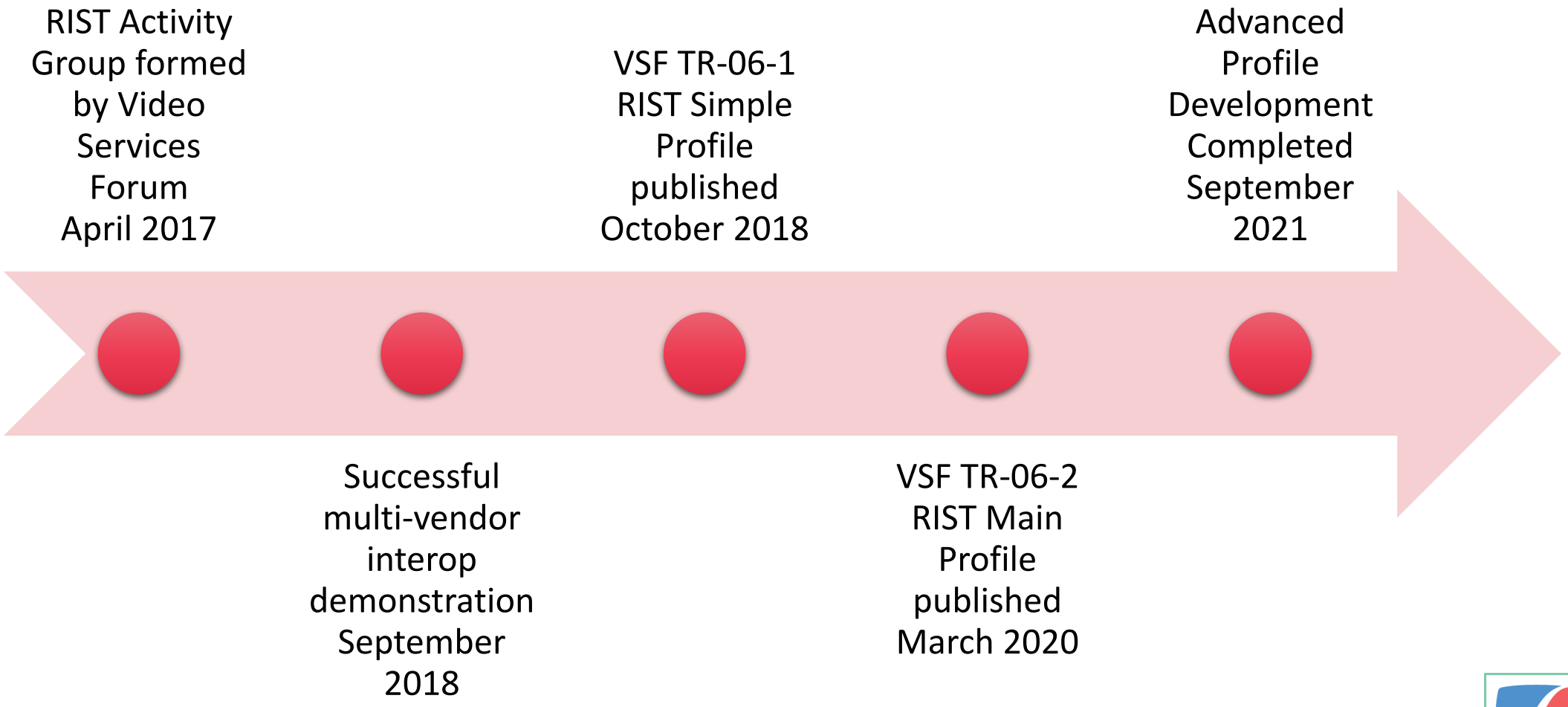

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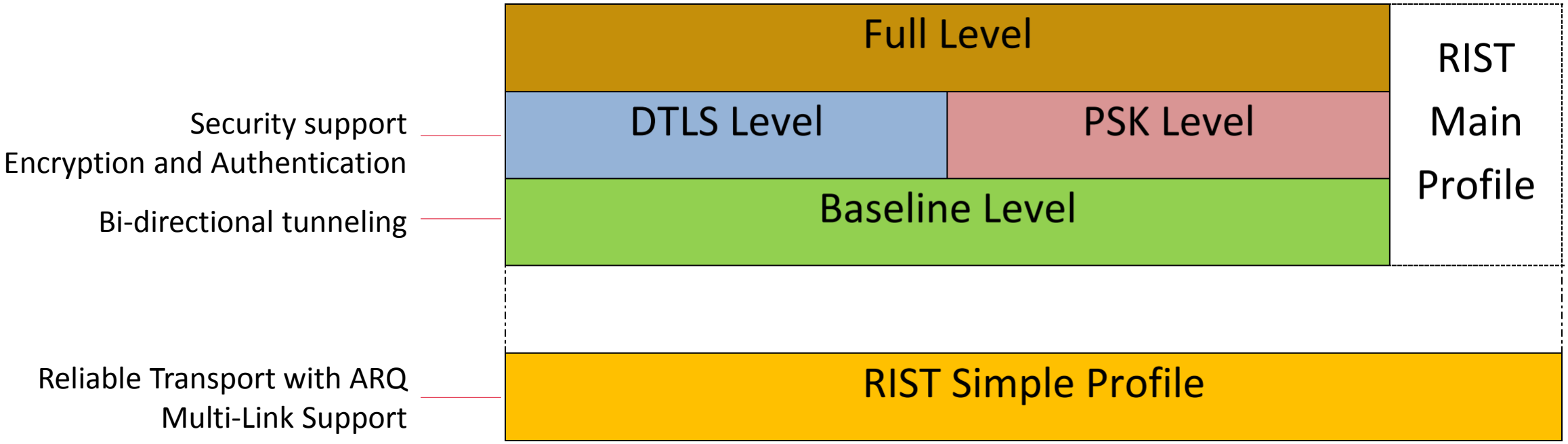
RIST Profiles and Levels



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Benefits of the Advanced Profile

The new RIST Profile: Advanced

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- Greatly enhanced tunneling capabilities
  - Any protocol delivered securely and reliably
  - Transparent Fragmentation
  - Mathematically Lossless Compression
- Enhanced PSK Security
  - New ciphers, payload hashing for data integrity
- Direct payload transport and Protocol Registry
  - Reduce size of packet headers
- Flow Attributes

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Advanced, Bi-Directional Tunneling

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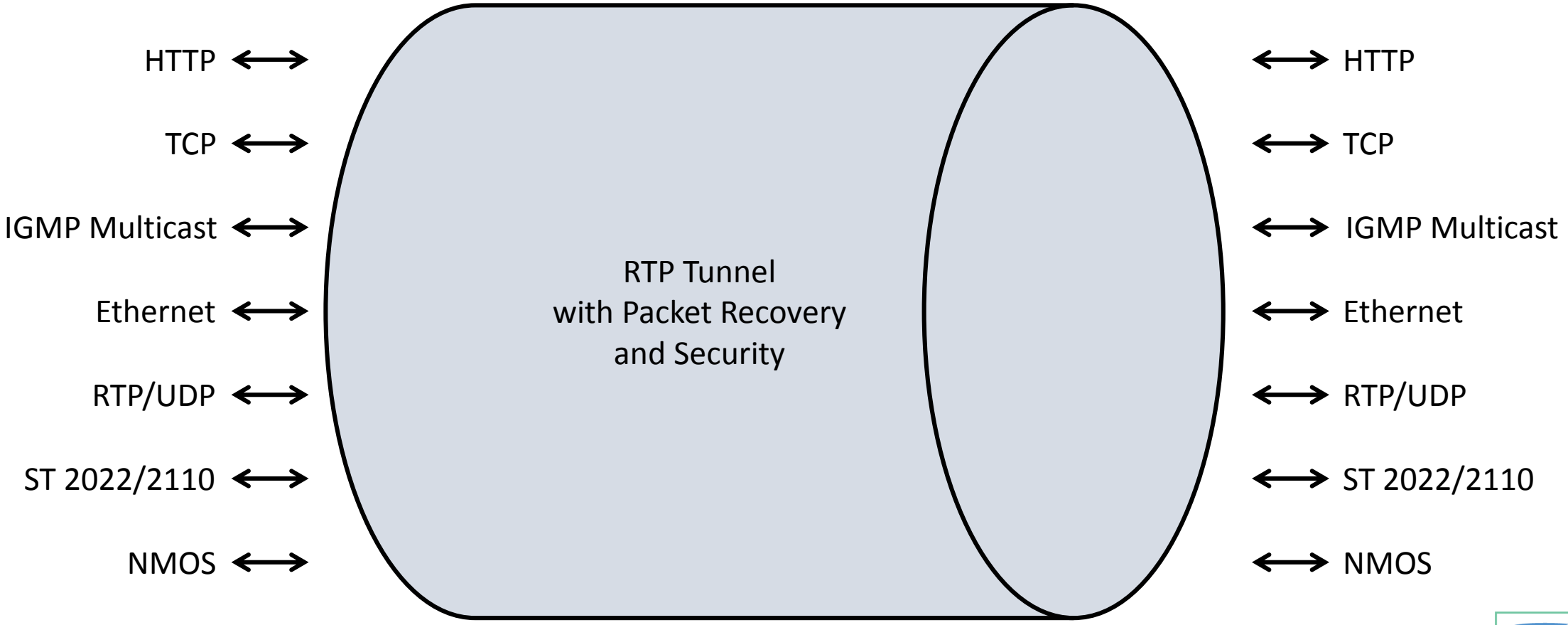

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Advanced Tunnel Benefits

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- Bi-directional data flow
- Reliable transport, with ARQ and FEC
  - Extends RIST support to any existing protocol
- Secure transport using PSK or DTLS
  - Can support authentication, authorization and data integrity
- Single UDP port capability for simpler firewall configuration

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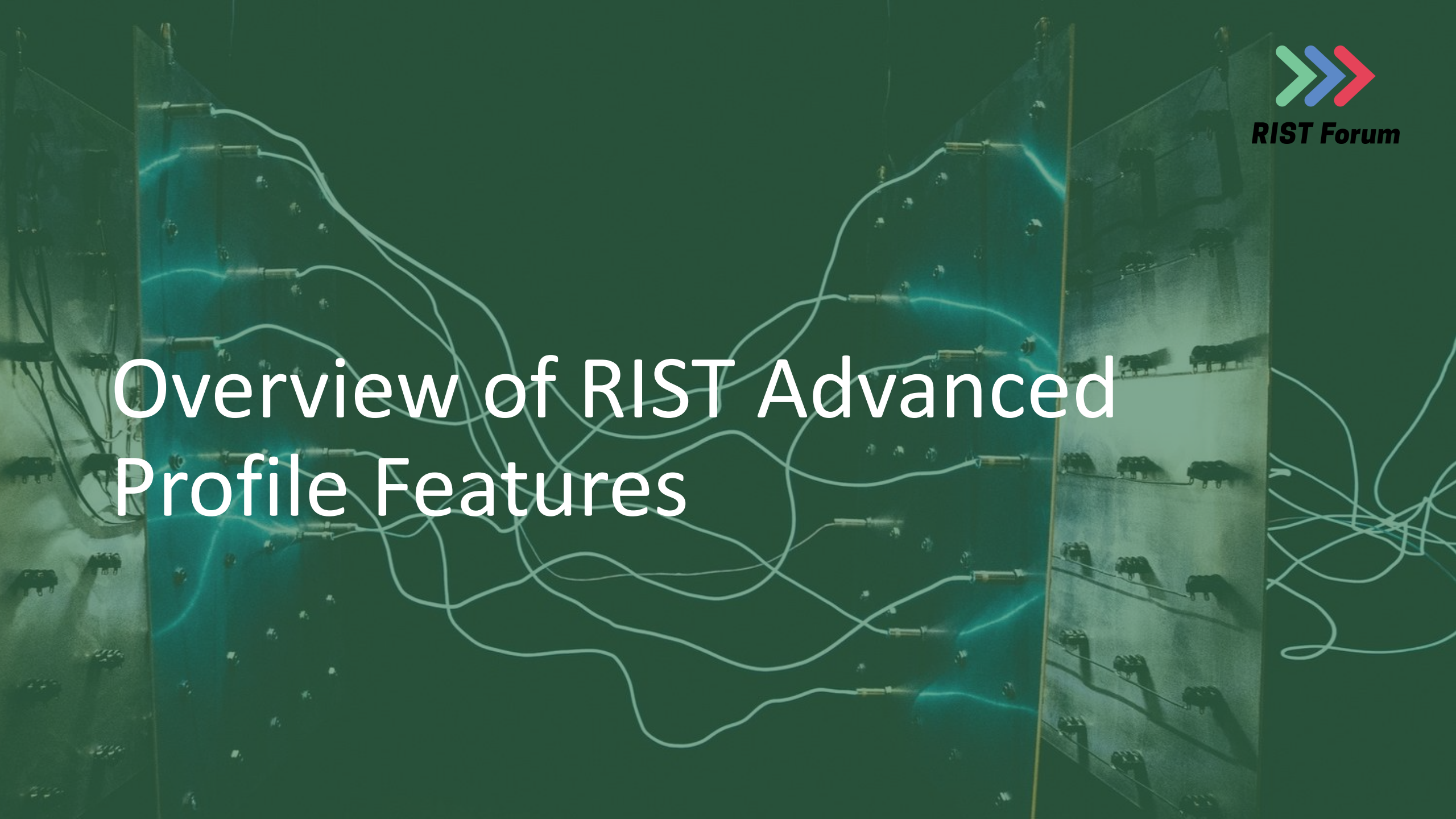

Overview of RIST Advanced Profile Features

Top-Level Technical Details

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- The base packet format is RTP
  - Format is aligned with the work being done by the VSF ST 2110 over WAN AG
  - Header includes a sequence number extension to 32 bits
  - 1 MHz timestamp for more precise timing
  - Additional optional fields to support enhanced functionality
- RTP packet payload is an encapsulated tunnel packet or a control packet

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Supported Encapsulated Types

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- IPv4 Packet
- IPv6 Packet
- TR-06-2 Reduced-Header UDP Packet
- Control Packet (defined by Advanced Profile)
- Direct Payload Packet (defined by Advanced Profile)
- Layer-2 Ethernet Frame
- Generic GRE Packet
- TR-06-2 GRE Packet

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Transparent Fragmentation

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- It is relatively common today to have MTU mismatches between local networks and the Internet
  - Local networks may support jumbo packets, unlike the Internet
  - Tunnel overhead may take a packet over the MTU
- IP fragmentation is messy, and permanent
- RIST Advanced Profile fragmentation is reversible
  - Packets restored to their original state at tunnel receiver
- BONUS: ARQ operates on fragments
  - Fully reliable transport with smaller retransmissions
  - Fragments are recovered and re-ordered prior to reassembly – much simpler implementation than IP fragmentation

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Lossless Compression

- Optional LZ4 Compression can be used on any packet
  - Mathematically lossless – no change to data in any way
  - Very good compression performance
- Can significantly reduce signal bandwidths
  - Particularly for uncompressed and compressed video signals
- Specification can be updated in the future with other lossless compression algorithms
  - Similar format as used in IPComp

New PSK Ciphers

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- RIST Main Profile only supported the AES-CTR cipher, with no hashing
- RIST Advanced Profile support:

Cipher Suite	Notes
AES-CTR	Same as Main Profile, no hashing
HMAC-SHA256	No encryption, hashing only
AES-CTR-HMAC-SHA256	Main Profile encryption with hashing
AES-GCM	Encryption and hashing, native in many CPUs
CHACHA20-POLY1305	Encryption and hashing

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Hashing for Data Integrity

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- PSK systems based on AES-CTR can be vulnerable to malicious packet replacement or corruption
  - If fake packets with flipped bits are injected in the stream, they may be accepted by the receiver
  - Can cause erroneous data to be decoded and corrupt the stream
- Relies on shared secret hash key at sender and receiver
  - Secure hash added to each packet at sender using secret key
  - Receiver calculates same hash using shared key
  - If receiver result does not match hash from sender, then packet is dropped

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Direct Payload Transport

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- Eliminate need for IP/Ethernet headers for many popular protocols
  - Can reduce overheads significantly
  - Can act as NAT function for bridging between address spaces
  - Allows the use of low-latency audio/video multiplex alternatives
- Uses unique, registered Payload ID for each protocol/packet type

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Protocol Registry

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- Direct payload identifiers are registered in open database
  - Based on standards organization and standard numbers
  - Innovative way to ensure interoperability
- Registry currently maintained by VSF
  - Simple, open approval process for adding new entries
  - Hosted on GitHub
  - Registry is not public yet – will be launched when TR-06-3 is approved

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The Registry Today

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main · 1 branch · 0 tags · Go to file · Add file

cjr052402 Include instructions to sort the spreadsheet. f85d2ef on May 6

Admin-Guide.html	Include instructions to sort the spreadsheet.
LICENSE	Initial commit
README.md	Add the Admin Guide.
Registered_Payload_Format_Des...	Transferred the data from the test repository.
Registered_Payload_Format_Des...	Transferred the data from the test repository.
Registered_Payload_Format_Des...	Transferred the data from the test repository.

README.md

VSF TR-06-03 Payload Format Descriptor Registration

This is a registration repository for the Payload Format Descriptor field in the upcoming VSF TR Specification.

How to add new entries to the table

Important: The table is a Microsoft Excel file with formulas. It must only be edited with Excel. Other tools may break it.

The steps are:

1. Carefully review section 5.2.7 of VSF TR-06-3 for the rules on how to assign values.
2. Open the Excel spreadsheet.
3. Use the drop-down in the **Organization** column to select the organization from which the document

Organization	ID Type	Document	Part/Sub-Part	ID Flavor	Descriptor (Dec)	Descriptor (Hex)	Description
VSF	0	1	0	0	4096	00001000	TR-01: JPEG2000 using 7 TS packets as per ST-2022-2
VSF	0	1	0	1	4097	00001001	TR-01: JPEG2000 using 7 TS packets as per ST-2022-2 Column FEC
VSF	0	1	0	2	4098	00001002	TR-01: JPEG2000 using 7 TS packets as per ST-2022-2 Row FEC
RFC	1	2250		0	269011456	1008CA00	MPEG2 Transport Stream over RTP
RFC	1	6184		0	270018560	10182800	AVC elementary stream over RTP. Includes the RFC 6184 RTP header.
RFC	1	6416		0	270077952	10191000	MPEG4 audio (AAC) over RTP
RFC	1	7231		0	270286592	101C3F00	HTTP traffic on Advanced Profile Tunnel
RFC	1	7540		0	270365696	101D7400	HTTP2 Traffic on Advanced Profile Tunnel
RFC	1	7587		0	270377728	101DA300	Opus audio over RTP
RFC	1	7741		0	270417152	101E3D00	VP8 over RTP
RFC	1	7742		0	270417408	101E3E00	WebRTC ?
RFC	1	7798		0	270431744	101E7600	HEVC elementary stream over RTP. Includes the RFC 7798 RTP header.
SMPTE	2	2022	1	0	603128064	23F30100	FEC Packets
SMPTE	2	2022	2	0	603128320	23F30200	TS over RTP as per ST 2022-2
SMPTE	2	2022	3	0	603128576	23F30300	Piewise linear VBR video
SMPTE	2	2022	5	0	603129088	23F30500	FEC Packets
SMPTE	2	2022	6	0	603129344	23F30600	Uncompressed Transport of Full SDI Raster over RTP (including audio and ancillary data)
SMPTE	2	2022	8	0	603129856	23F30800	Uncompressed Transport of Full SDI Raster over RTP (including audio and ancillary data) with PTP
SMPTE	2	2049	0	0	604012544	24008000	MXF OP1a streaming transport with RFC 6597 defining MXF KLV over RTP
SMPTE	2	2110	20	0	606016512	241F1400	Uncompressed Video Essence over RTP
SMPTE	2	2110	30	0	606019072	241F1E00	Uncompressed Audio Essence over RTP
SMPTE	2	2110	31	0	606019328	241F1F00	Uncompressed Transparent AES3 over RTP
SMPTE	2	2110	40	0	606021632	241F2800	ST291 Ancillary Data over RTP
ISO/IEC	4	13818	1	0	1102041152	41AFD040	Payload is a transport stream without RTP or other wrapper
ISO/IEC	4	13818	1	1	1102041153	41AFD041	Payload is a program stream without RTP or other wrapper
ISO/IEC	4	23008	1	0	1120862272	42CF0040	MMT
AES	5	67		0	1342194432	50004300	AES 67 Audio
ATSC	6	324		0	1631846400	61440000	STLTP and DSTP

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Flow Attributes

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- Mechanism to provide useful info for receivers
  - Flow ID, flow bandwidth, priority, SDP file
- Standardized JSON schema
  - Each flow can be labeled uniquely
  - Includes timestamps for version control
  - Supports sub-flows within other flows
- Similar to PAT/PMT/SDT in Transport Streams

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Future Directions

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TR-04 Parts (subject to change)

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- TR-06-4 Part 1: Receiver Synchronization **(nearly complete)**
- TR-06-4 Part 2: Use of Wireguard VPN in RIST Systems **(nearly complete)**
- TR-06-4 Part 3: Firewall Traversal – RIST Relay **(major progress)**
- TR-06-4 Part 4: Control and Management for RIST Systems **(work started)**
- TR-06-4 Part 5: RIST Congestion Control
- TR-06-4 Part 6: Adaptive Encoding in RIST Systems
- TR-06-4 Part 7: Automatic Configuration for RIST Systems
- TR-06-4 Part 8: Internet/Satellite Hybrid Model
- TR-06-4 Part 9: RIST IGMP Listener

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Who is behind RIST?

The Players

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All the companies in the RIST AG also participate in the RIST Forum

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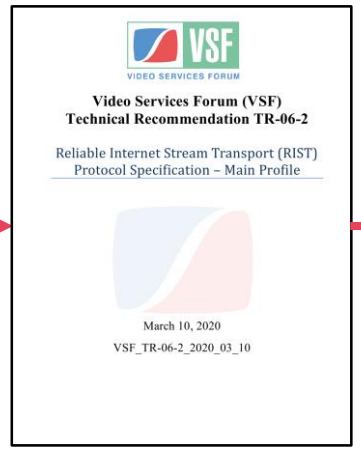
RIST Activity Group

The tech people

RIST Specification



The marketing people

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Sampling of RIST Forum Members

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Questions?

Thank you!

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