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z/TPF HTTP Support

Mark Gambino
TPF Development Lab

Communications Subcommittee
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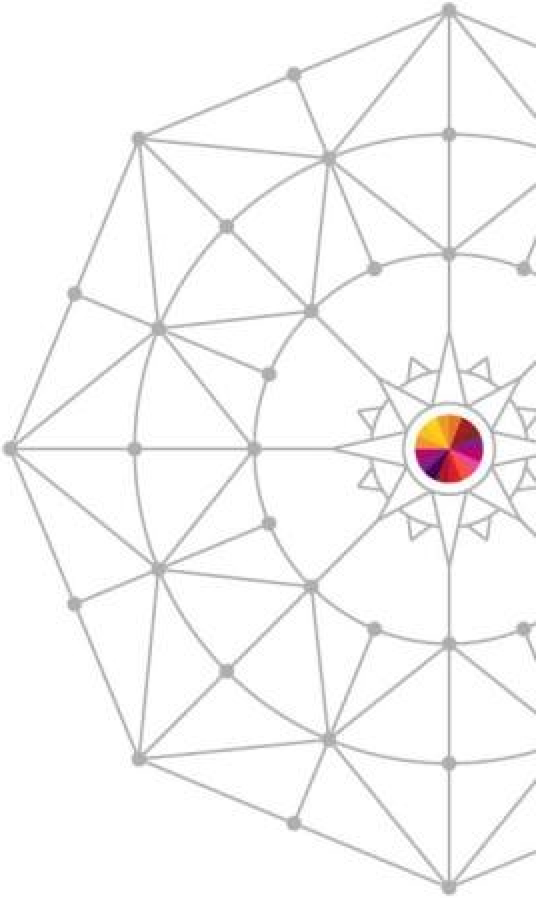

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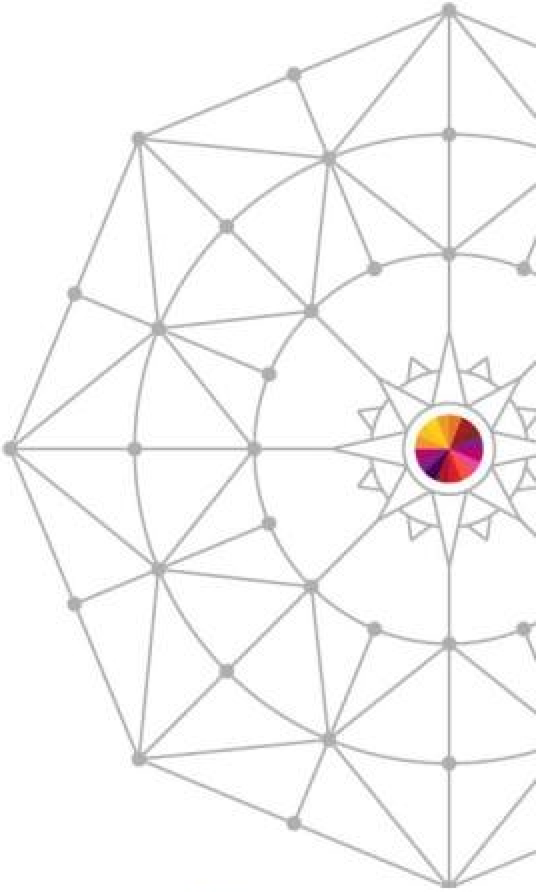

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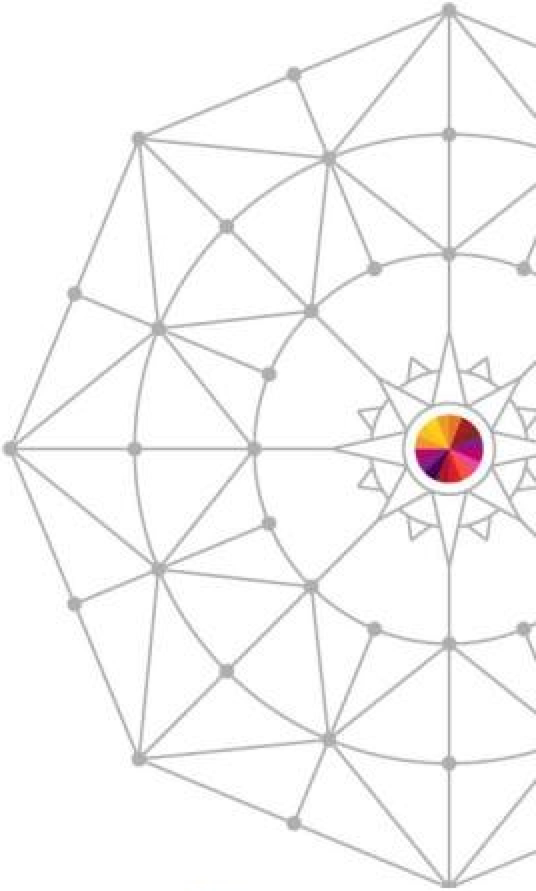
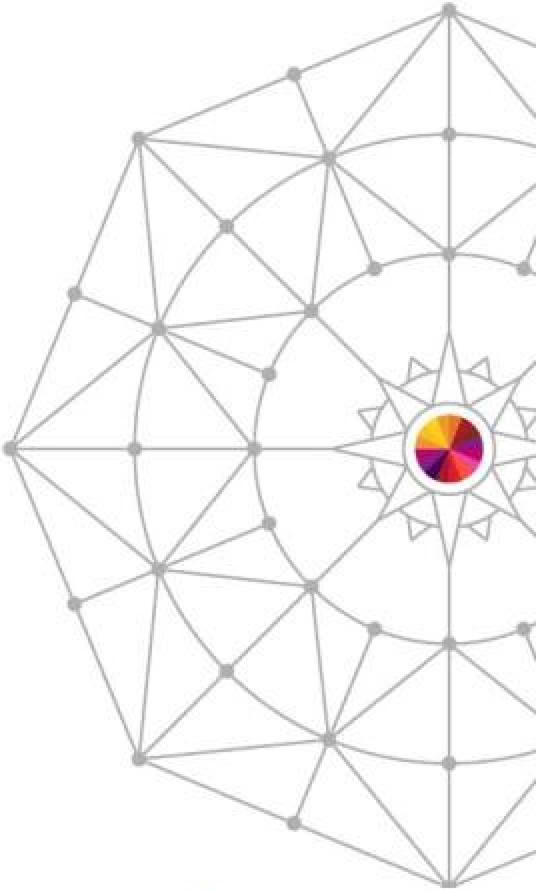
HTTP Client Support on z/TPF

- APARs PJ32013 and PJ32052 (PUT 4)
- Provided APIs to enable z/TPF applications to send HTTP requests to remote HTTP servers
- Processing was synchronous
  - Application ECB that issues the API is suspended until the response is received from the HTTP server
- Uses the HTTP client library within libcurl
- Can send requests over regular HTTP or secure HTTP (HTTPS – HTTP over SSL)



Advanced HTTP Client Support on z/TPF

- APARs PJ34208, PJ37296 PJ37454 (PUT 7)
  - Allowed for asynchronous programming model where ECB that issues the HTTP client API can exit and a new ECB is created when the HTTP response is received
- APARs PJ41866 and PJ41867
  - Performance enhancements to reduce amount of CPU used by HTTP client support
  - Improved scalability
    - Increased number of shared sessions supported
    - Maximum request queue limits expanded
  - Fixes to various problems also included



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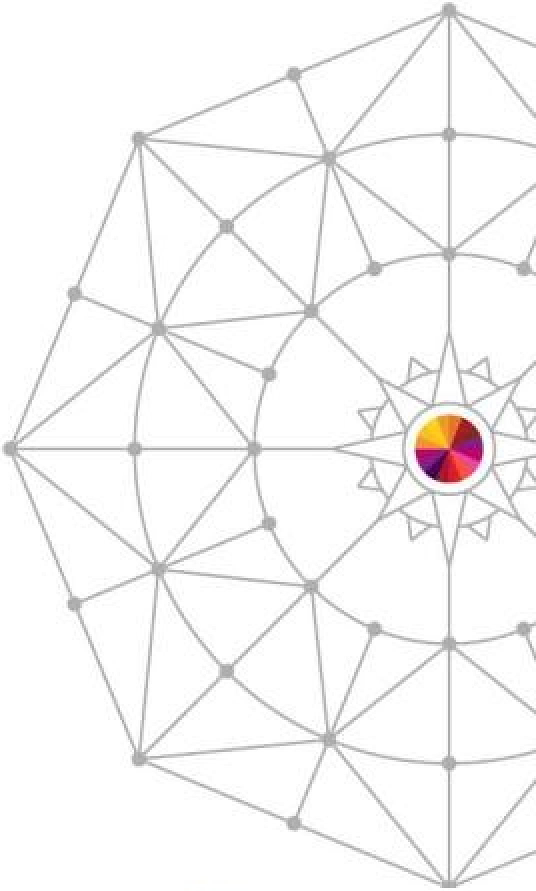
HTTP Client POST/PUT Flows

- The default behavior of libcurl of an HTTP POST or PUT request requires 4 flows:
  1. Client sends HTTP header with “Expect 100” in the HTTP header along with the request URL
  2. Server responds with HTTP status code 100 (continue)
  3. Client sends the HTTP request message
  4. Server responds with HTTP status code 200 and the HTTP response message
- The first message exchange is done to verify that the target exists before sending the request message

Optimized HTTP Client POST/PUT Flows

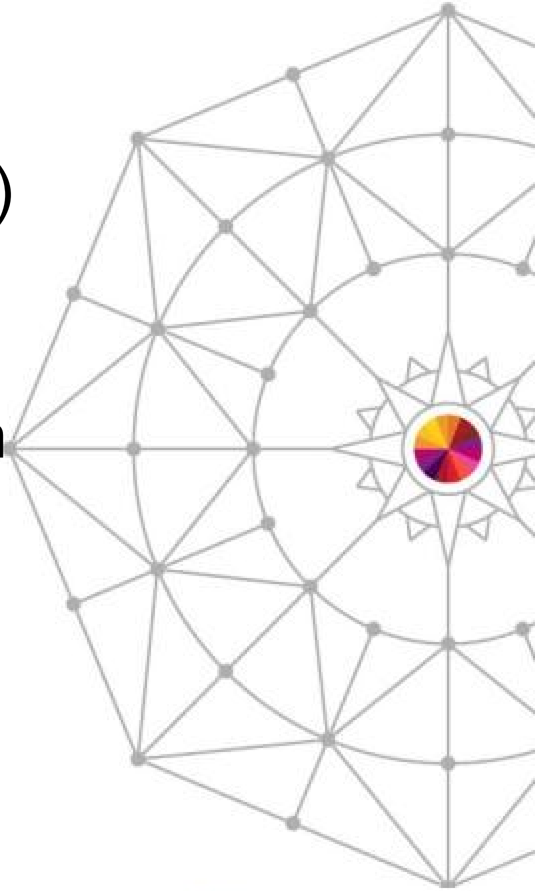
- Application program can override the default behavior to reduce the number of message flows
- Application program issues the *tpf_httpPerform* API that includes an empty expect header “Expect:”
- This results in 2 flows:

1. Client sends the entire HTTP request
2. Server responds with HTTP status code 200 and the HTTP response message



Apache HTTP Server

- TPF 4.1 supported the Apache HTTP Server 1.3
- z/TPF APARs PJ34337 and PJ34514 (PUT 5) added support for the Apache HTTP Server 2.2
- Apache is a very robust HTTP server that can be customized with many optional plug-in modules to perform various functions
  - For example, if you build Apache with the mod_ssl module enabled, this allows you to use secure HTTP server (HTTP over SSL)



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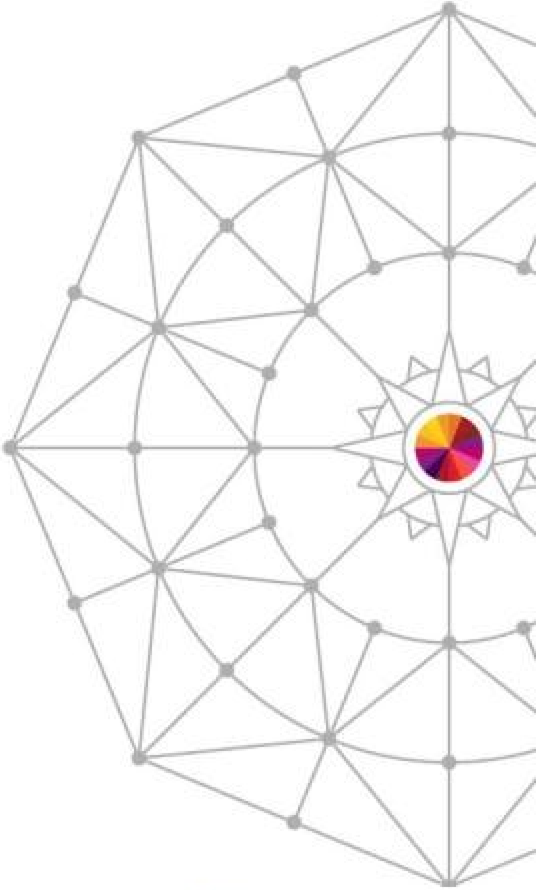
z/TPF HTTP Server Support

- APARs PJ39252 and PJ39550 (PUT 9)
- Came about because of TPFUG requirement "SOA00002 – *Lightweight HTTP Server for SOAP Messaging"*
- Subset of the HTTP to be an efficient message transport
- Allows for asynchronous programming model where one ECB receives an HTTP request and a different ECB can send the HTTP response



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z/TPF Secure HTTP Server Support

- APARs PJ41171 (PUT 10) and PJ41711
  - PJ42080 fixes a base problem you might encounter using secure HTTP server
- Adds HTTPS (HTTP over SSL) support to the z/TPF HTTP server
- Define to z/TPF using the new INETD SSL model (APAR PJ41170)
  - Specify PGM-CHS1 on ZINET ADD command to define a secure HTTP server application
- Added network services database (NSD) support for all z/TPF HTTP servers (HTTP and HTTPS)
- Interface between z/TPF HTTP server layer and application server program is the same for both HTTP and HTTPS servers
  - Easy to migrate from HTTP to HTTPS

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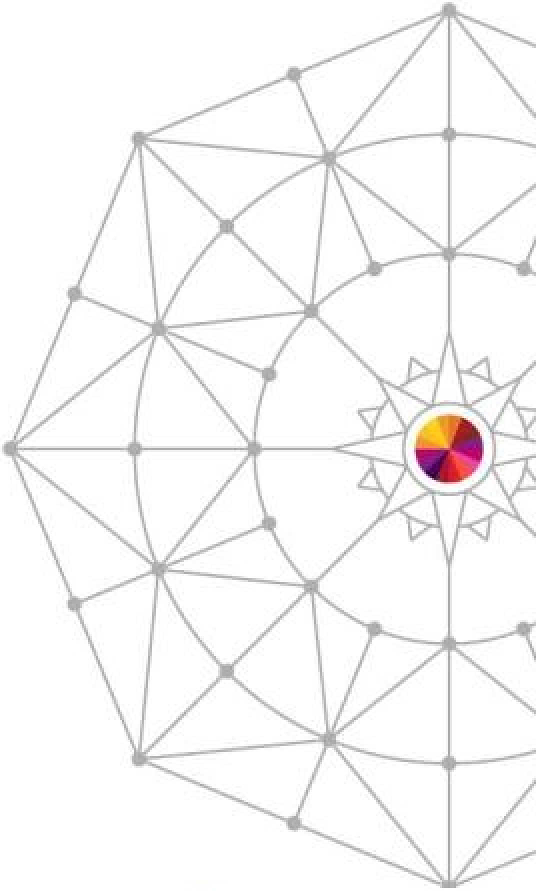
Regular vs Secure HTTP Server Performance Comparison

- HTTP client driver was run using different message sizes over persistent HTTP sessions
  - – First test sent regular HTTP traffic
  - – Second test sent secure HTTP traffic
- Server application on z/TPF used async model
  - – When ECB #1 received an HTTP request message it created ECB #2 that then sent the HTTP response
- z/TPF HTTP Server was running on an LPAR with 4 I-streams on z196, dedicated PR/SM



Regular vs Secure HTTP Server Performance Results

	Regular HTTP Traffic			Secure HTTP Traffic		
Message Size	Messages/ second	CPU Util	Message Rate at 100% CPU	Messages/ second	CPU Util	Message Rate at 100% CPU
100	49049	41.9%	117062	28892	46.2%	62537
1000	19557	72.2%	27087	12280	54.5%	22532
3000	9534	76.1%	12528	5097	56.3%	9053
5000	6705	80.9%	8288	3314	59.0%	5617

* Several factors influence performance. Your results may vary.

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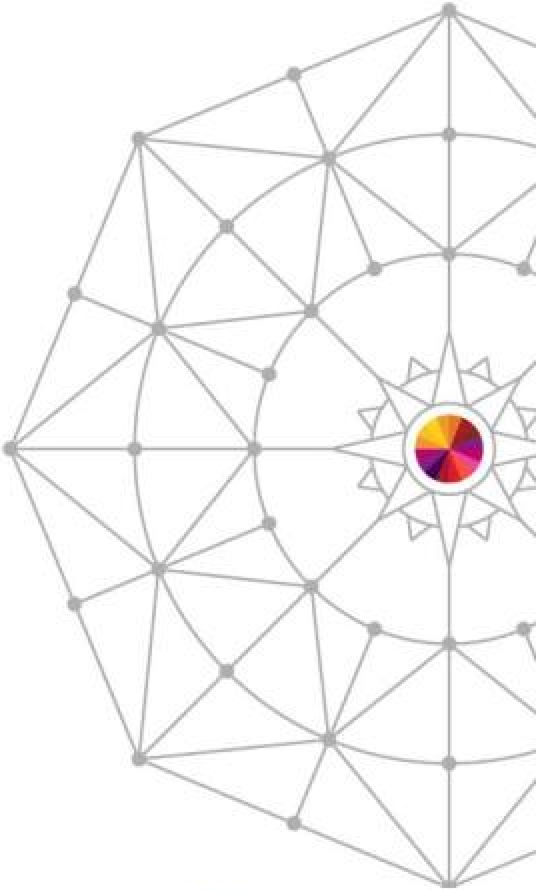
New INETD Model for SSL

- APAR PJ41170 (PUT 10)
- New MODEL-SSL option for INETD servers
  - Similar to MODEL-AOA2, but adds SSL
- INETD manages all the TCP socket and SSL session establishment
- Application programs and middleware just need to send and receive data
  - Same as what application programs do for INETD TCP MODEL-NOWAIT servers for non-SSL sessions
  - Easy to convert a TCP MODEL-NOWAIT server to MODEL-SSL server



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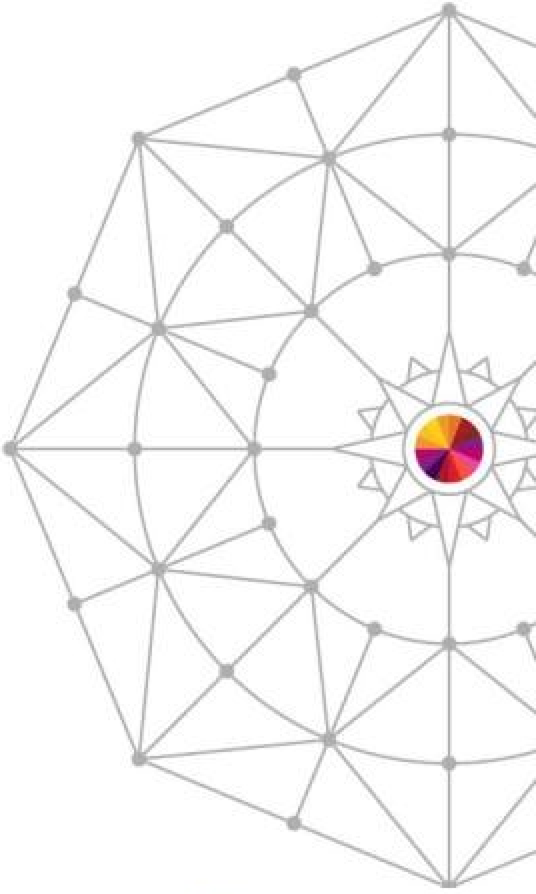
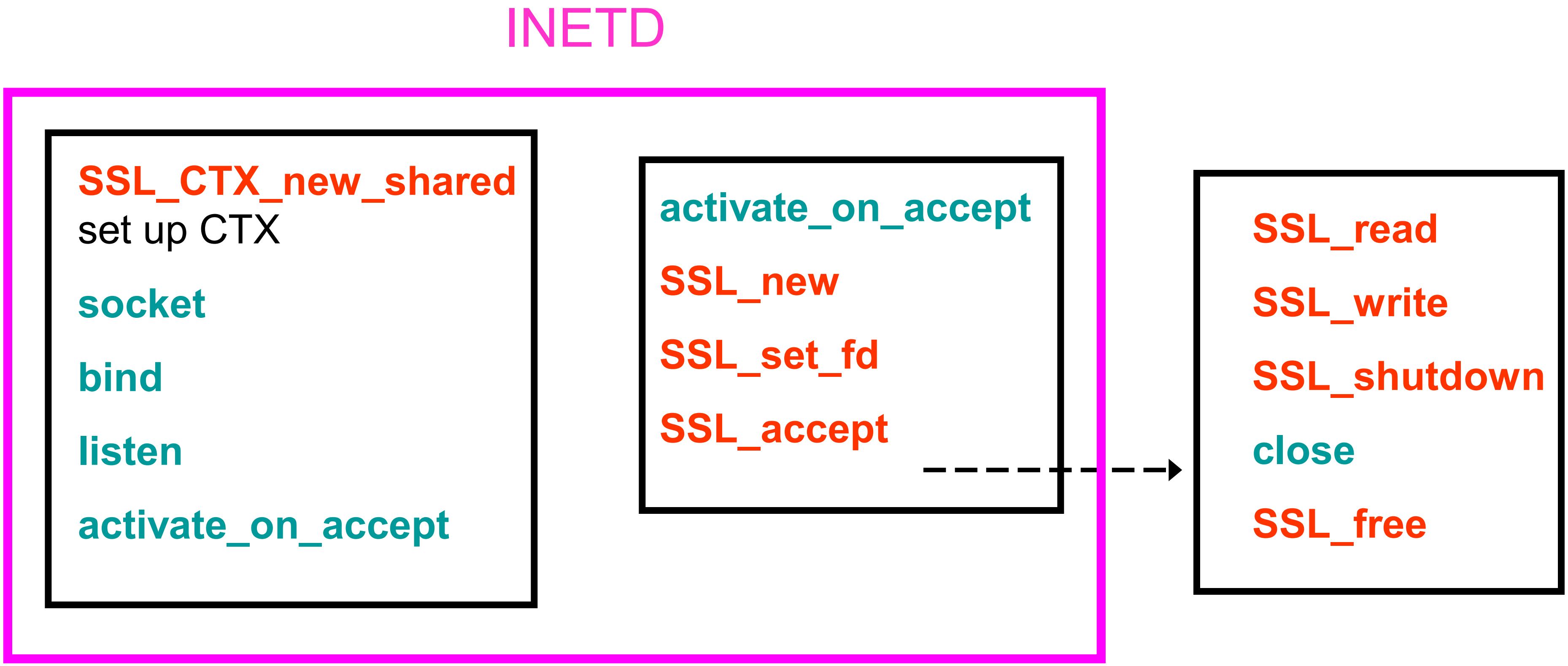
New INETD Model for SSL

- INETD responsibilities:
  - Create and manage the listener socket
  - Create a single CTX that can be used by all SSL sessions using this server application
  - Create SSL structures
  - Start SSL sessions
  - Automatically restart the listener socket if it fails
  - Automatically create a new CTX if the shared SSL daemons recycle
- Server application responsibilities:
  - Send and receive data over the SSL session
  - Shutdown the SSL session and close the connected socket



New INETD Model for SSL



INETD

SSL_CTX_new_shared
set up CTX

socket

bind

listen

activate_on_accept

activate_on_accept

SSL_new

SSL_set_fd

SSL_accept

SSL_read

SSL_write

SSL_shutdown

close

SSL_free

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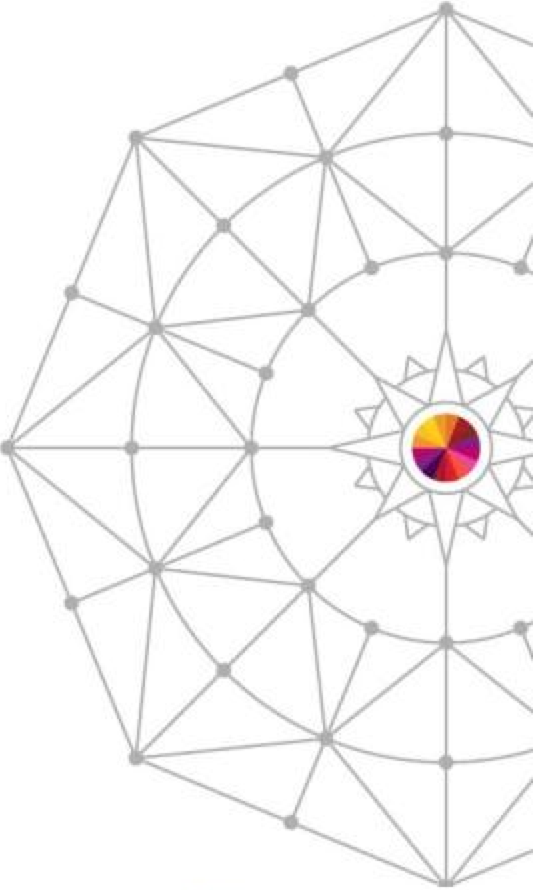
SSL Configuration Information New INETD Model for SSL

- SSL configuration information for the server application are defined using the existing *Application Configuration Files for SSL* mechanism
- Sample configuration file for SSL:

```
USESSL=YES
CIPHER=DES-CBC3-SHA
VERIFYPEER=NO
CERTIFICATE=/certs/tpfprodcert.pem
CERTTYPE=PEM
KEY=/tpfpubk/keypair1.pem
KEYTYPE=PEM
VERSION=TLSV1
```

New User Exit for New INETD Model for SSL

- INETD calls new user exit ussl.c when a MODEL-SSL application is starting or stopping
- ZINET START:
  - User exit allows you to initialize tables that are used by this application
  - User exit will be called before any SSL sessions are started
- ZINET STOP:
  - User exit will allow you to clean up tables that are used by this application



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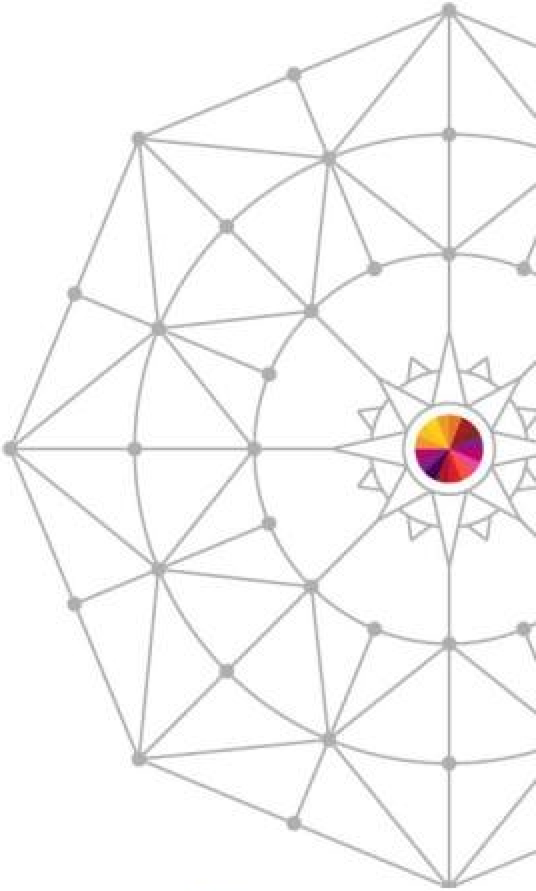

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