

Spring/Summer Young Researchers' Colloquium
on

SYRCoSE

Software Engineering

***The ARTCP header structure,
computation and processing in the
network subsystem of Linux
kernel.***

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TCP in wireless and heterogeneous networks

- Packet losses
 - Congestion avoidance

 - Indirect TCP
 - ECN
 - RTT and thresholds-based approaches
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Adaptive Rate TCP (ARTCP)

- Transparent replacement of TCP
 - Temporal characteristics-based data flow management algorithm
 - Logical separation of error correction and data flow management
 - No artificial congestion
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ARTCP and TCP compatibility

- TCP-compatible header structure
- Fallback to TCP mode “on a fly”
- ARTCP can be disabled in system



TCP header structure

Bit	0-3	4-7	8-15	16-31
0	Source port			Destination port
32	Sequence number			
64	Acknowledgment number			
96	Data offset	Reserved	Flags	Window size
128	Checksum			Urgent data pointer
160	Options			

ARTCP fields as TCP options

Byte	0	1	2	3	4	5	6	7
Value	1	1	253	6	PS field value			

PS (Packet Sequence) field

Byte	0	1	2	3	4	5	6	7
Value	1	1	254	6	TI field value			

TI (Time Interval) field

ARTCP packet transmission implementation

- Extended struct `tcp_out_options`
 - Modified `tcp_syn_options()`, `tcp_synack_options()` and `tcp_established_options()`
 - Modified `tcp_options_write()`
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ARTCP packet reception implementation

- Extended struct `tcp_options_received`
 - Modified `tcp_parse_options()`
 - Modified `tcp_v4_conn_request()`,
`tcp_rcv_synsent_state_process()` and
`tcp_rcv_established()`
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Time measurement for TI field in Linux

- Hardware timers
 - Software interfaces
 - Calculation of intervals in TI units
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Time measurement in x86 systems

- PIT (Intel 8523 and analogues)
- RTC
- APIC timer
- PM timer
- HPET
- TSC



“Clock source” concept in Linux

- Platform-independent and uniform interface
- Easy clocksource registration
- Rating-based choice



Software interfaces and units conversion

- `getnstimeofday()`
- `getrawmonotonic()`
- `artcp_ts_diff_to_ti()`



Work-in-progress and future work

- Complete ARTCP implementation
 - Performance analyzing with ns2 simulator and bench tests
 - Optimizations for asymmetric networks
 - Research of low-delay data delivery
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THANK YOU!

