

# Devicetree

## Linux kernel memory size FDT size

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181113\_1529

# Linux decreased memory use

From: Rob Herring <robh@kernel.org>

Subject: [PATCH 0/6] Shrinking DT memory usage

Date: Thu, 5 Oct 2017 14:44:16 -0500

<https://lore.kernel.org/lkml/20171005194422.26224-1-robh@kernel.org/T/#u>

Made some of the fields optional (based on CONFIG\_...) in

- struct property
- struct device\_node

CONFIG\_DYNAMIC requires most of the fields

Nicolas Pitre reported:

My test case went from 118072 bytes down to 21548 bytes with this series.

# dtc - ignore disabled nodes

New node property:  
/omit-if-no-ref/

Linux kernel v4.18

commit 50aafd60898a

scripts/dtc: Update to upstream version v1.4.6-21-g84e414b0b5bc

dtc repository

commit 4038fd90056e8

dtc: add ability to make nodes conditional on them being referenced

# dtc - tests/omit-no-ref.dts

```
/dts-v1/;
```

```
{
```

```
    test-phandle = <&node3>;  
    test-path = &node4;
```

```
    /omit-if-no-ref/ node1: node1 {  
        bar = <0xdeadbeef>;  
    };
```

```
    node2: node2 {  
        foo = <0x42>;  
    };
```

```
    node3: node3 {  
        test = "test";  
    };
```

```
    node4: node4 {  
        test;  
    };
```

```
};
```

```
/omit-if-no-ref/ &node2;  
/omit-if-no-ref/ &node3;  
/omit-if-no-ref/ &node4;
```

# Linux decreased memory use

Remove full path from np->full\_name

- add %pOF to generate full path at run-time

Attempt to remove phandle properties

- <https://lore.kernel.org/lkml/87mv92szsw.fsf@concordia.ellerman.id.au/T/#u>
- phandle values are also a field in the node
- issue with DLPAR systems needs to be resolved before implementing

# Linux decreased memory use

Nicolas Pitre reported:

My test case went from 118072 bytes down to 21548 bytes with this series.

After adding dtc skipping disabled nodes and no longer storing the full path of every node, Nicolas reported:

... it is down to 11732 bytes

# Linux increased memory use

nodes as kobjects

phandle cache

- reduced overhead of phandle access
- size:  $4 * \text{roundup\_pow\_of\_two}(\# \text{ of phandles})$

# Linux memory opportunities

Option to not load overlay metadata from FDT

- If bootloader has applied overlay(s) and no more overlays will be applied

Place FDT overlay metadata somewhere other than nodes, and in a more compact format

- may be able to access in-place in FDT image
- more compact format is a win

Option to not load inactive nodes from FDT



# FDT size

## Overlay Metadata format and encoding

### Motivation:

- size reduction of FDT and kernel data
- remove metadata from tree name space

# Metadata - see FDT format slides

How should the metadata required by overlays be encoded in the FDT?

Discussion was in progress on devicetree-compiler list

Subject: [RFC] devicetree: new FDT format version

Message-ID: <b96829f9-2e8b-fdc5-5090-58591e2260cf@gmail.com>

Date: Mon, 22 Jan 2018 00:09:18 -0800

**side-effect: update of FDT format required**

# Metadata - base FDT overhead

Metadata overhead measured for arch/arm/boot/dts/\*

“**symbols old fmt**” is added size from '**dtc -@**'  
for the **current FDT format**

“**symbols new fmt**” is added size from '**dtc -@**'  
for **first proposed format in the email thread**

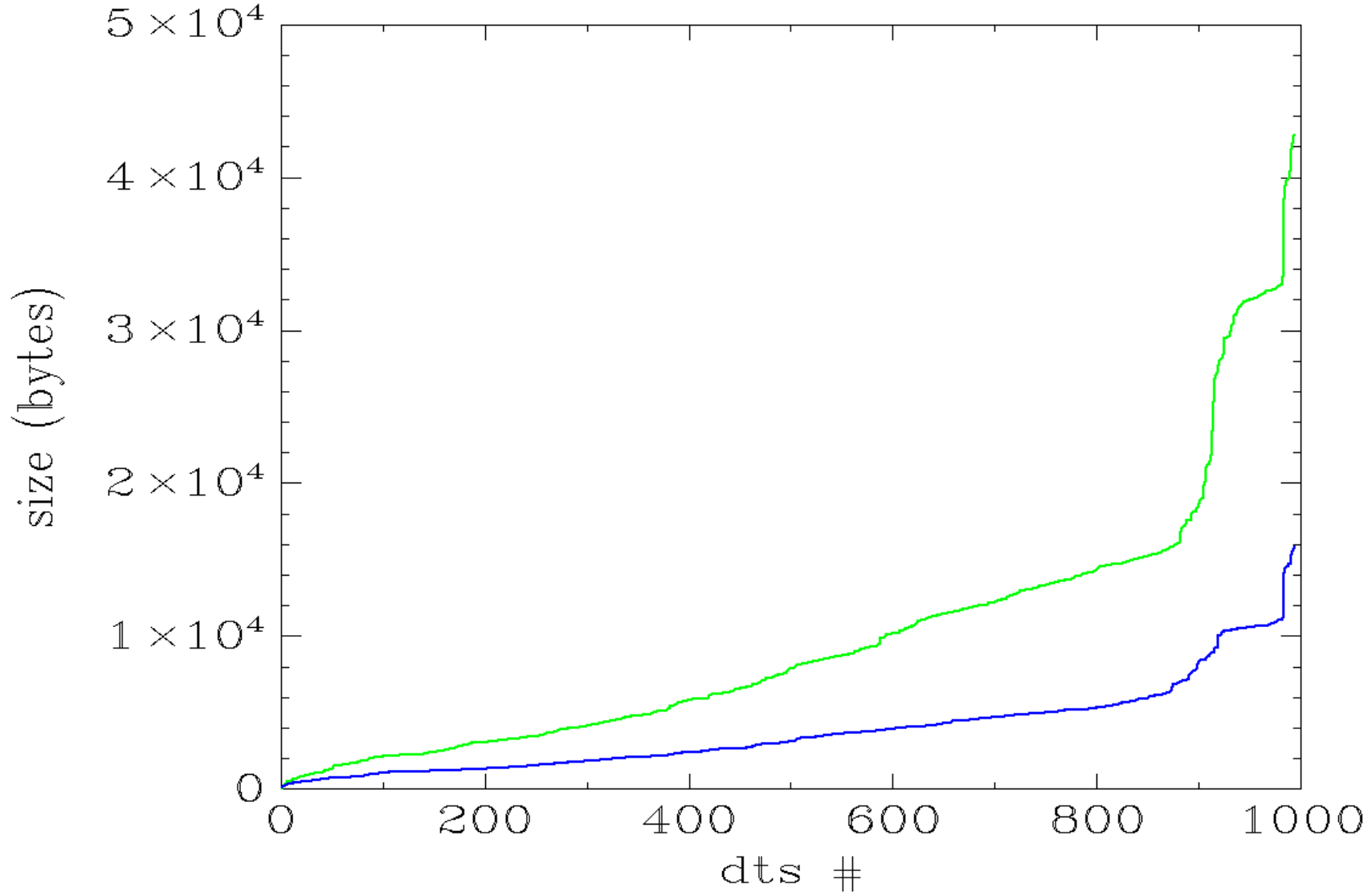
# Metadata - base FDT overhead

Metadata overhead measured for arch/arm/boot/dts/\*

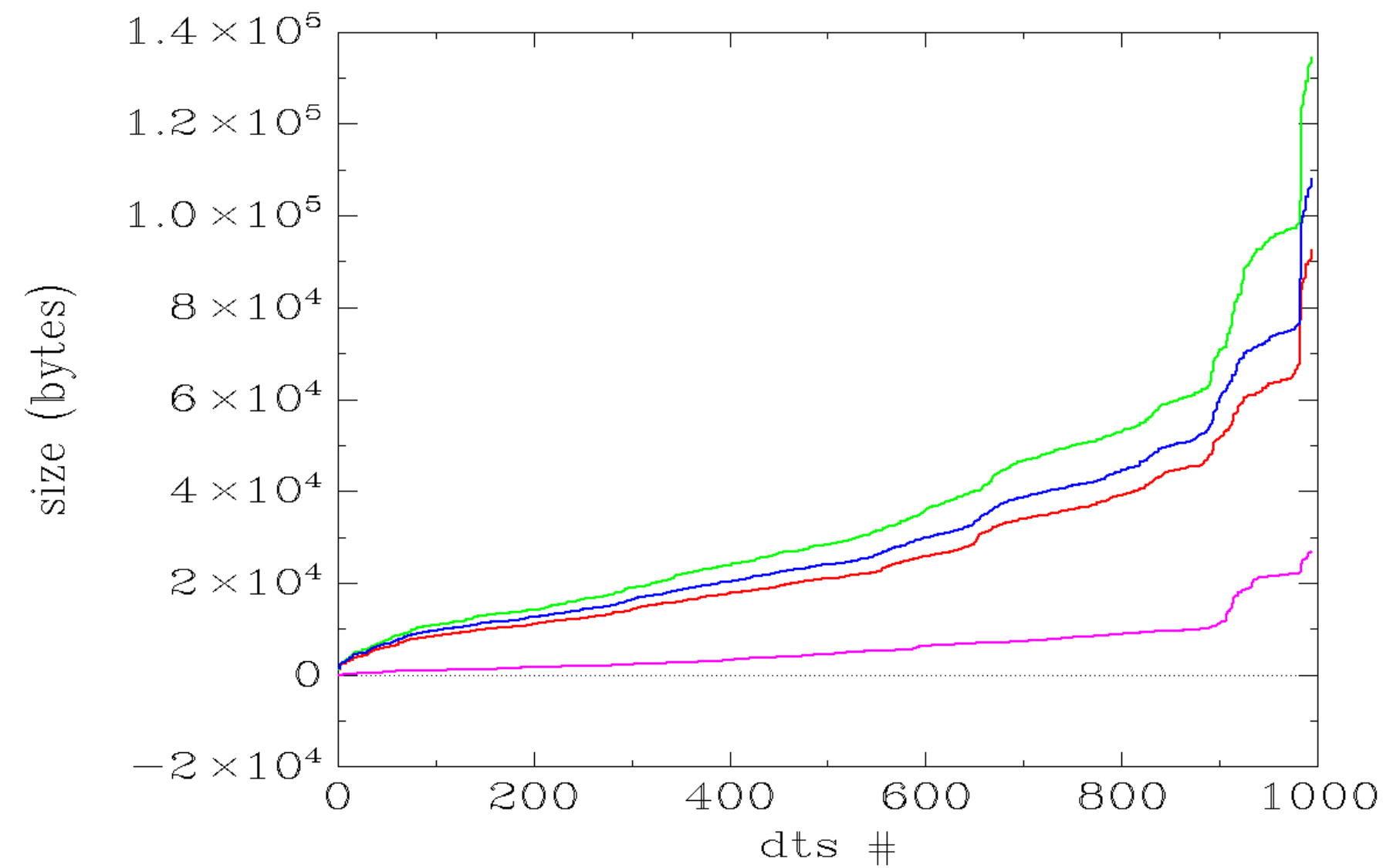
row	dtb no symbols	delta symbols	delta new fmt	bytes saved
----	-----	-----	-----	-----
99%	90531	42721	15766	26955
83%	44302	14582	5163	9419
66%	26277	11662	4628	7034
49%	21047	7328	2754	4574
33%	12864	4305	1705	2600
16%	12009	2929	1520	1409
0%	1220	68	149	-81

- “**delta symbols**” is added size from '**dtc -@**'
- “**new fmt**” is added size from '**dtc -@**' for first proposed in the email thread

FDT size, sort on: new format symbols  
symbols old fmt, symbols new fmt



FDT size, sort on: saved  
old fmt, new fmt, no symbols, saved



# FDT size

Thought for the future:

Tool to strip overlay metadata from FDT

Maybe “easy” to implement with proposed new FDT format.

I discourage implementing with current FDT format (more legacy to obsolete)