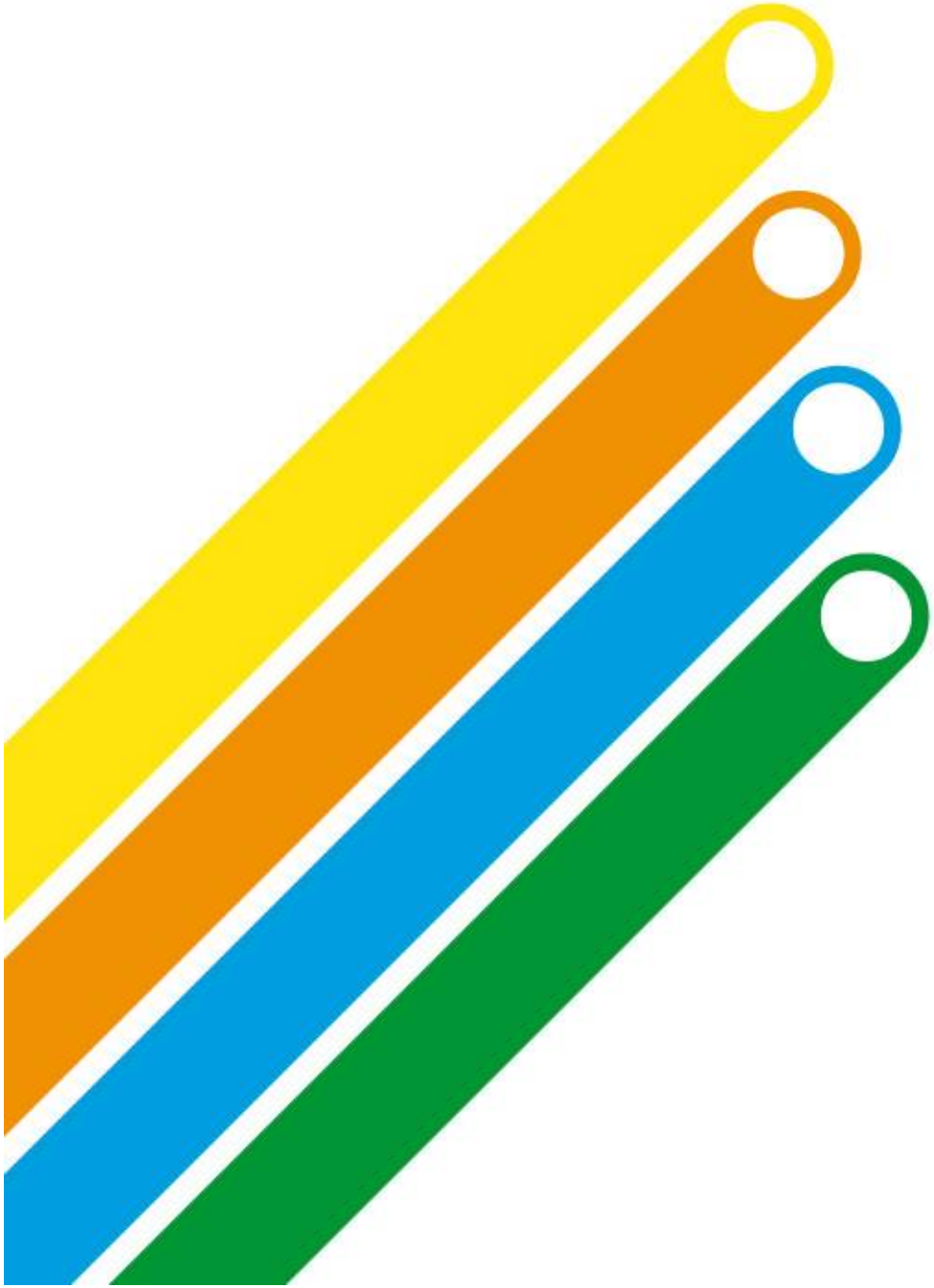

# Métro service disruptions

**Carl Desrosiers**
Chief Executive Officer

**Dominique Lemay**
Executive Director, Métro services

**May 30, 2013**

# A few figures for 2012

- 412.6 million passenger rides in 2012, a 1.9% increase over 2011
- 1.3 million passenger rides per average weekday, of which 40% were by métro, 31% by bus and 29% by both modes of transportation
- In 2012, the métro system provided 895,000 passenger rides per average weekday:
  - 78.2 million kilometres travelled
  - Reliability: 97.6% of customers arrive on time

# A difficult time

- In the last week, our customers were subjected to six extended breakdowns in métro service: one of them resulted in a service interruption throughout the entire metro system for nearly one hour

- Since the métro's new operating systems were put into service (14 months ago), seven major service disruptions have occurred

# Questions we must ask ourselves

- Are all of these service disruptions related?
- What is wrong with the computer systems?
- Is there a general trend toward less reliability?
- What are we doing to reduce the number of breakdowns?

# Service disruptions – May 21–28, 2013

| MAY | DURATION (MINUTES) RUSH HOUR | LINE | REASON (No connection between disruptions) |
|---|---|---|---|
| Tuesday - 21 | 53 | All 4 lines | Remote transmission failure |
| Wednesday - 22 | 47 | Orange | Someone on the tracks |
| Thursday - 23 | 28 | Blue | MR-73 train breakdown |
| Thursday - 23 | 28 | Orange | MR-73 train breakdown |
| Monday - 27 | 65 | Orange | Intervention by emergency services |
| Tuesday - 28 | 26 | Green | MR-63 train breakdown |

**Even if these disruptions only represent 1% of weekly operating hours, they still had a considerable impact on transit users.**

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# What is behind these computer system failures?

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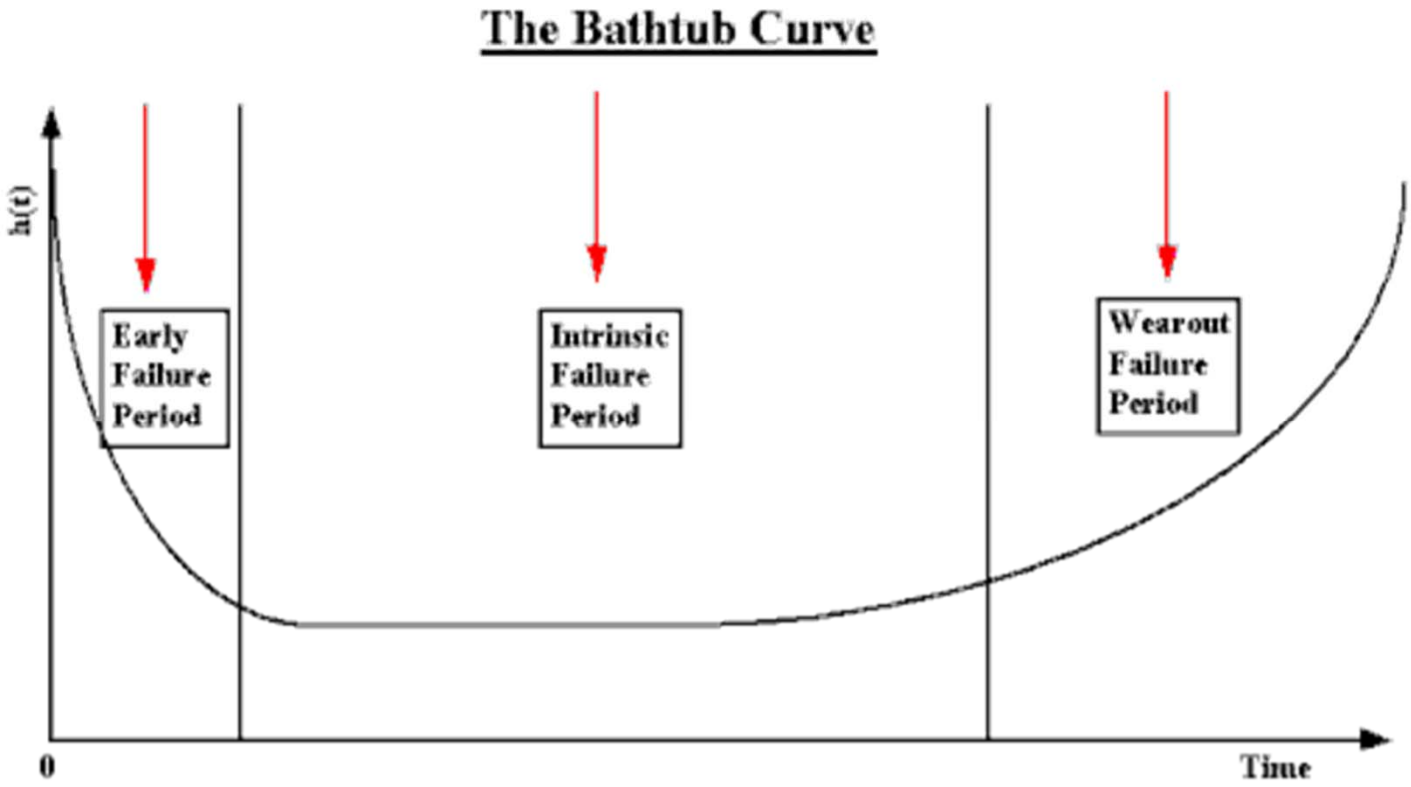
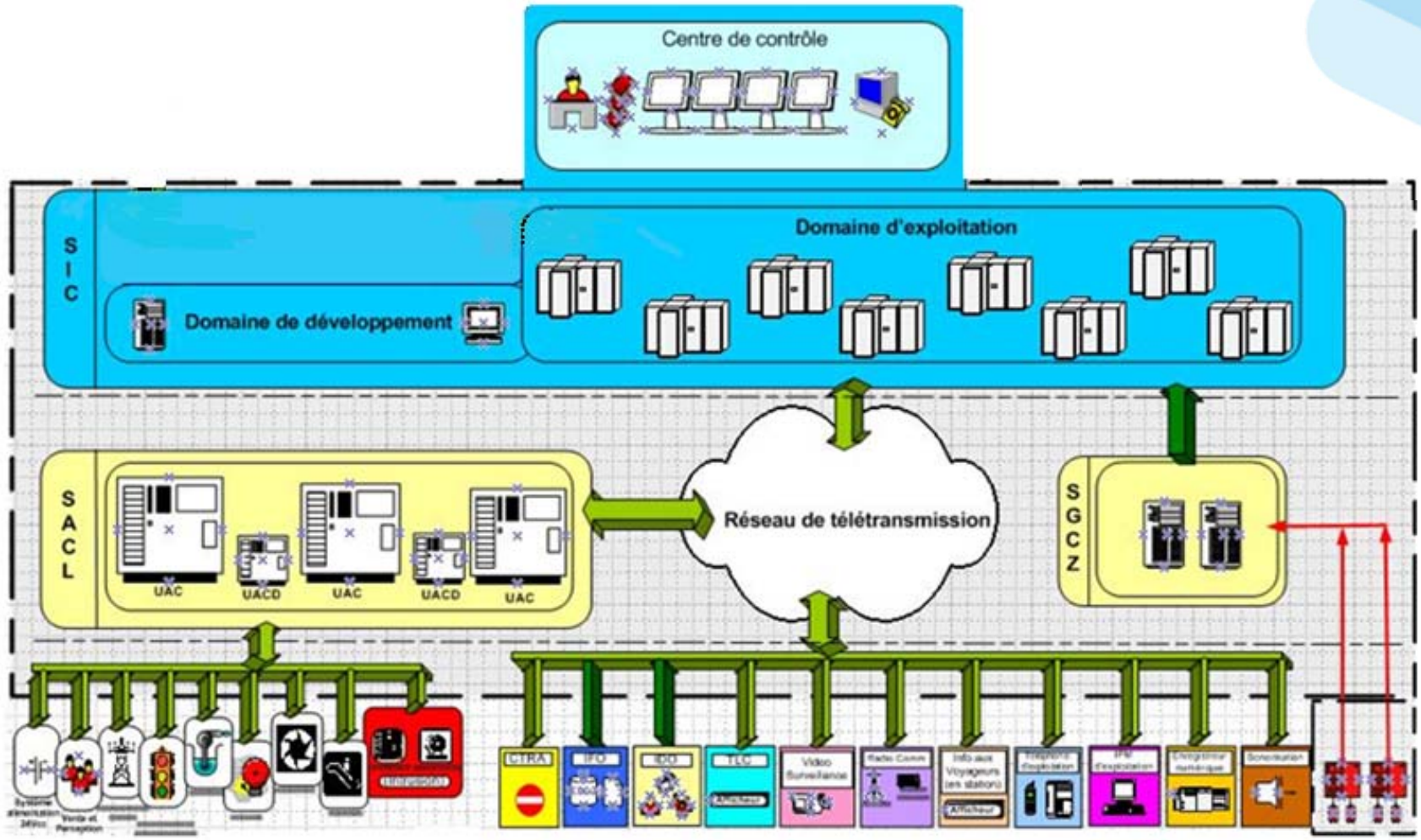
# Reliability of equipment over time



# The new operating system software (CC)

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# Operating system deployment dates

- Operating system software partly deployed for inauguration of métro extension to Laval in 2006
- Gradual deployment of operating system throughout remainder of métro network from September 2011 to March 2012
- Investment of $174 M: a necessary change
  - It represents less than 1% of the métro's replacement value, estimated at some $20 B

# Métro operating systems in numbers

- Over 100 servers
- 2 000 linked radios
- 2 000 surveillance cameras
- 95 computers
- 800 automated systems

# Métro operating systems in numbers

- 12.8 million data inputs in system
- 105,000 control signals
- 100 interfaces
- Over 40 software programs and applications
- Several million lines of programming code
- In all, some 15,000 components

# Corrective measures

- June 2012: Router card failure in remote transmission network
  - Replacement of card the next day
- July 2012, March and April 2013: Overloaded computer servers:
  - Temporary solution applied in October 2012
  - Software update installed April 7, 2013

# Corrective measures

- November and December 2012: overload of alarms processing server
  - Establishment of a new architecture for processing protocols
  - Data solution purchased and applied on March 17, 2013
- May 21, 2013: software malfunction in remote transmission network server installed in 2006
  - Router rebooted
  - Update provided by manufacturer now being tested

# Steps taken to remedy the situation

- Action plan to boost stability and make operating system software more robust
  - Objectives of plan:
    - Reduce the number of failures – outages / breakdowns
    - Reduce the duration of failures
    - Reduce the scale of failures
  - Development work kept to a minimum:
    - Technical support team focused on action plan
  - Who is carrying out this work?
    - A joint Alstom-STM team
    - Plan guided by high profile international expert

# Steps taken to remedy the situation

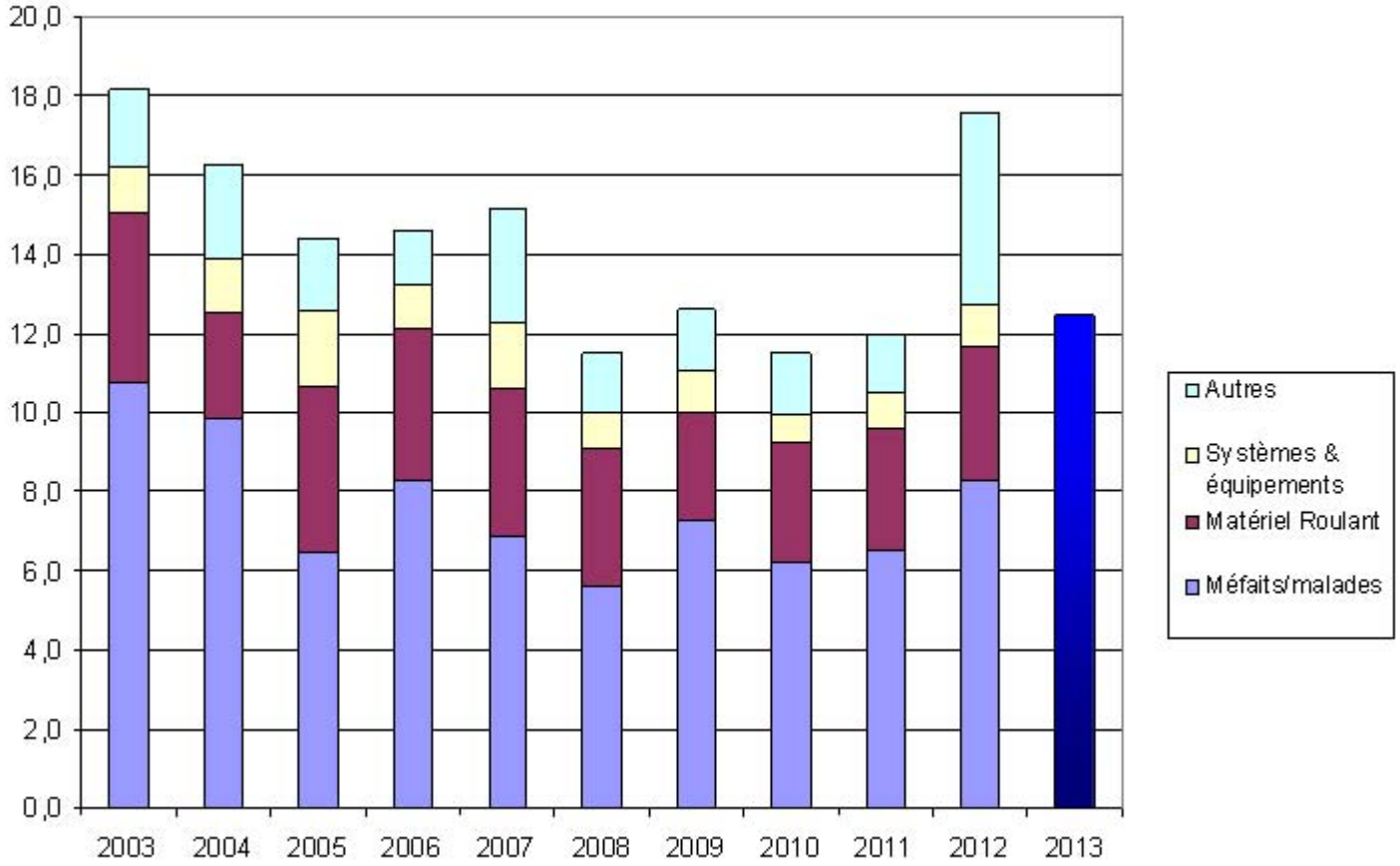
- Situation monitored by Board of Directors' information technology sub-committee along with independent experts

# Is there a downward trend in métro reliability?

# STM trend over time

## Service disruptions (5 min and more) per million km

### First 4 months of year - 2003-2013

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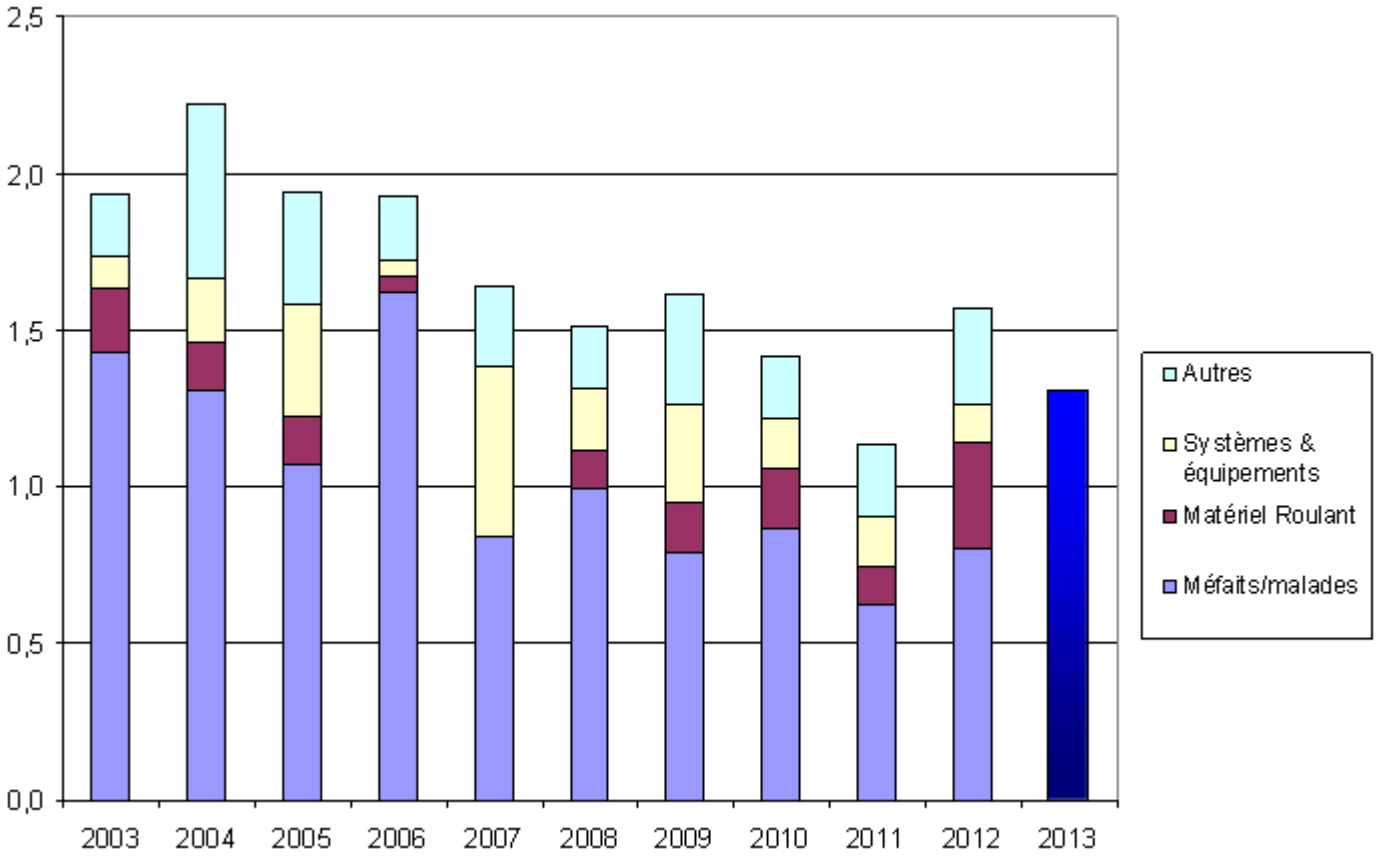
# STM trend over time

## Longer (20 min +) service disruptions per million km

### First 4 months of year - 2003-2013

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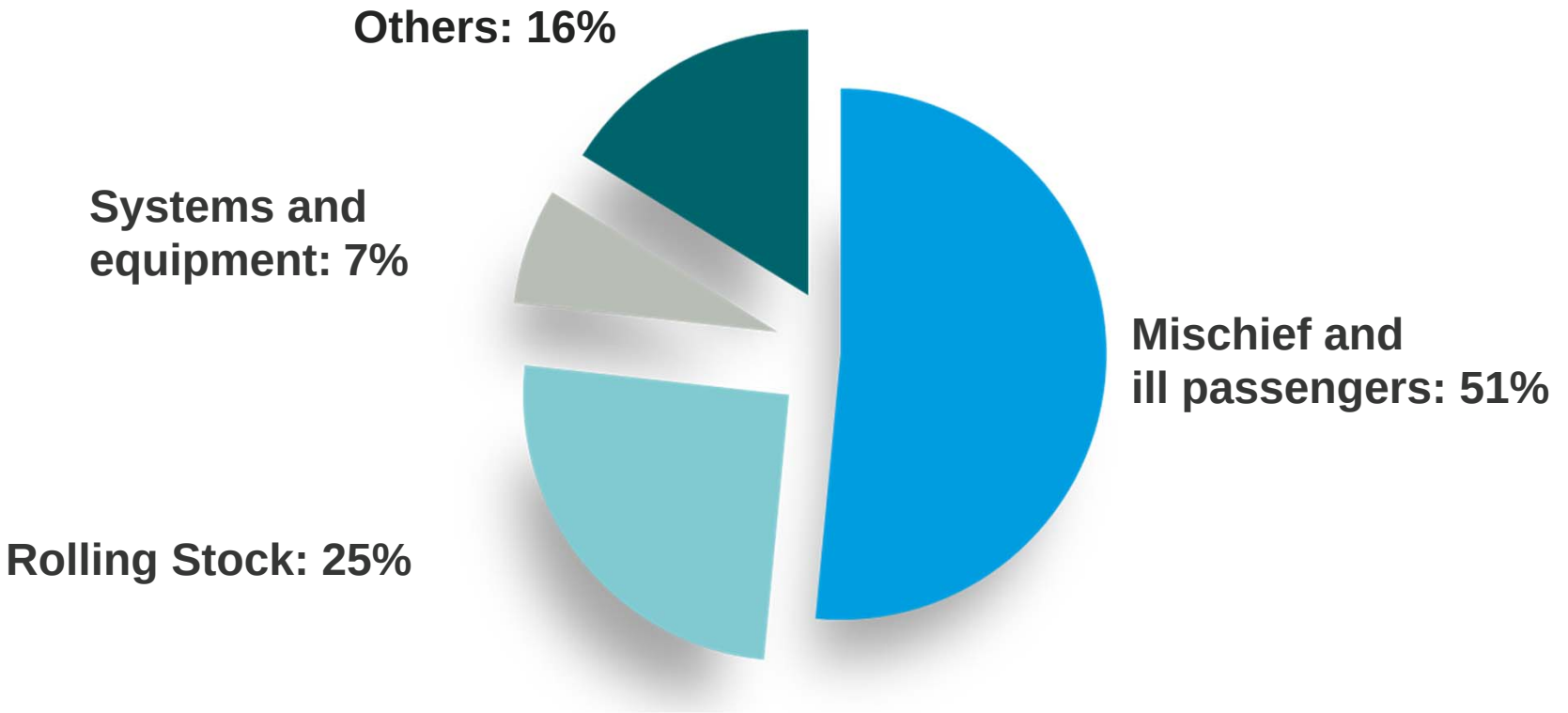
# Types of service disruptions
## (in a typical year)

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# Benchmarking by Imperial College London

**Metros in Asia:**

- Bangkok
- Beijing
- Delhi
- Guangzhou
- Hong Kong
- Shanghai
- Singapore
- Sydney
- Taipei

**Metros in Europe:**

- Barcelona
- Berlin
- Brussels
- Lisbon
- London
- Madrid
- Milan
- Moscow
- Naples
- Newcastle
- Paris

**Metros in America:**

- Mexico
- Montréal
- New York
- Rio de Janeiro
- Santiago
- Sao Paulo
- Toronto

# Benchmarking by Imperial College London

Number of service disruptions per million km

- Metros in Asia: 7.3
- Metros in Europe: 38.8
- Metros in America: 22.6
- **Global average: 24.7**

# Benchmarking by Imperial College London

Number of service disruptions per million km

**Montréal:**

- First 4 months of 2012: 17.6
- First 4 months of 2013: 12.5
- 2012: 13.2

- **Global average: 24.7**

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# Benchmarking by Imperial College London

Number of service disruptions (5 min and more) per year for metros travelling an equal distance:

- Asia: 567
- Europe: 3031
- America: 1763
- **Global average: 1928**
- **Montréal: 1029, or 47% less than global average**

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# What is STM doing to reduce the number of breakdowns?

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# STM action plan

**Systems, equipment and infrastructure:**

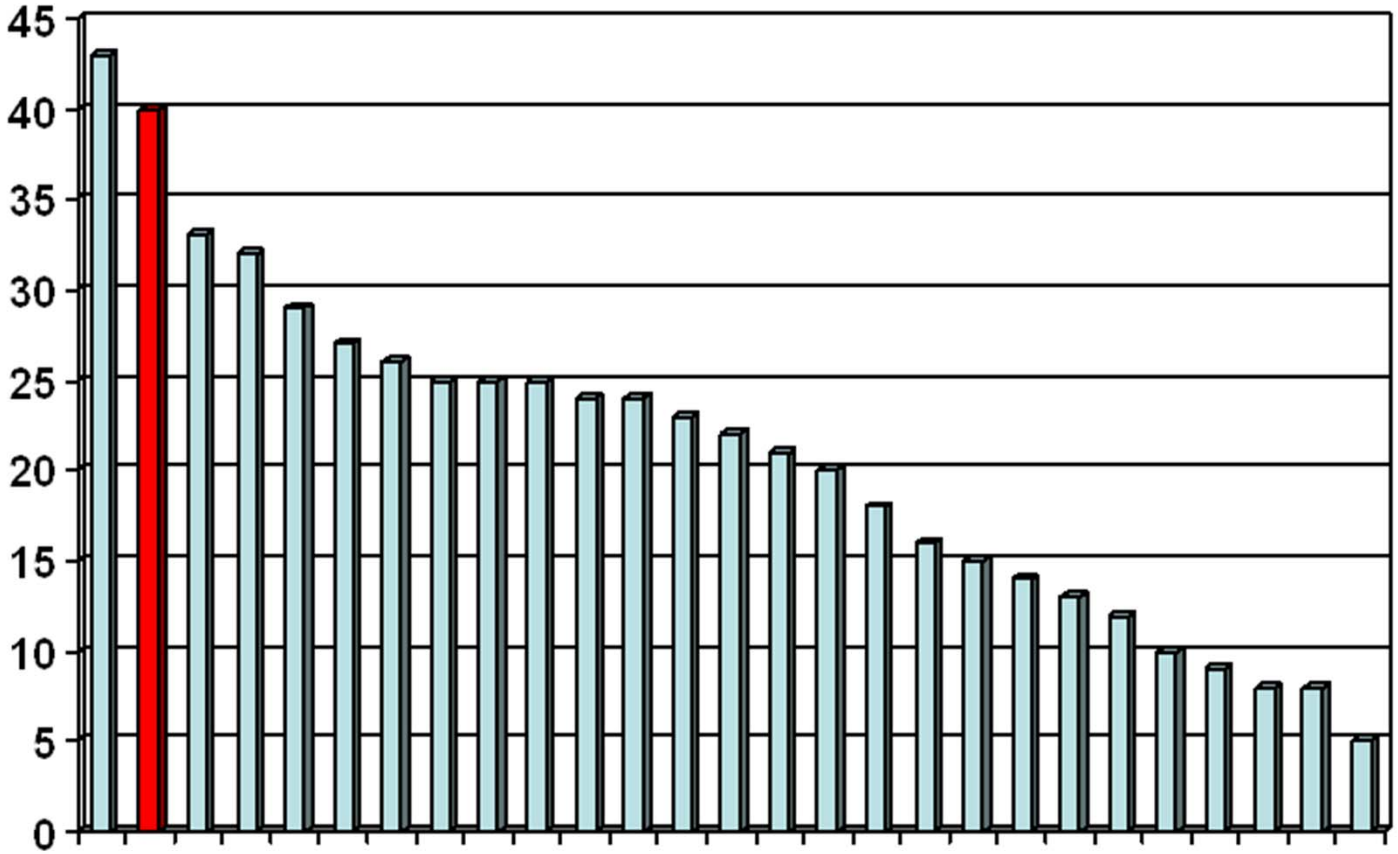
- Action plan to boost stability and make the computer systems' components more robust
- Continuous improvement of maintenance programs
- On-going Réno-Systèmes and Réno-Infrastructures programs
- Accelerated replacement of assets

# STM action plan

**Rolling Stock:**

- Replacement of older cars by new AZUR métro cars
- Continuous improvement of maintenance programs
- On-going investment in métro car reliability
  - Major maintenance program for doors on MR-73 cars
  - Overhaul of motors

# Average age of metro car fleets around the world

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# STM action plan

## Mischief and ill passengers:

- *Assistance* concept
- Objects on tracks
- Yellow textured edge tiles
- Operational improvements in new AZUR métro cars

AZUR

# STM action plan

## Mischief and ill passengers:

- Connecting with customers on train platforms
- Audio signal for door closing
- Protective covers on emergency brake handles
- Awareness campaigns among transit users

# STM action plan

## Customer information:

- Automated information originating from control centre systems
  - Issue information more quickly
  - Advise users of disruptions lasting more than 10 minutes (earlier than 20 minutes +)
- Add cause and duration of disruption to information
  - Provide complete information on all communication platforms – telephone, web, mobile apps, sms and email alerts, Twitter.
  - Issue same information through external outlets as inside métro
  - Ensure a fast and reliable source of information

# STM action plan

## Customer information:

- Following on Twitter
  - Create a Twitter feed for each métro line
  - Post additional information about service disruptions lasting more than 10 minutes, from 6 a.m. to 8 p.m., seven days a week
  - Concentrate information on Twitter (withdrawal from Facebook)

# Conclusions

- STM regrets customers were negatively impacted by a string of system failures and service disruptions
- The main issue is boosting stability and making computer systems' components more robust
- There is no downward trend in métro reliability